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Inclusion of *Sinia* in *Sauvagesia* (Ochnaceae)

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Abstract. Based on flower and seed morphology, it is proposed to include the genus *Sinia* in *Sauvagesia* s.l. As a result, the new combination *Sauvagesia rhodoleuca* (Diels) M. C. E. Amaral becomes necessary.

Resumo. Com base na morfologia de flores e sementes, propõe-se incluir o gênero *Sinia* em *Sauvagesia* s.l. Em conseqüência, a nova combinação *Sauvagesia rhodoleuca* (Diels) M. C. E. Amaral torna-se necessária.

Key words: Flora of China, Ochnaceae, *Sauvagesia*, *Sinia*.

Diels (1930) described *Sinia* as a new genus of Ochnaceae in his *Miscelania sinensia*. The flowers of this genus were characterized by the presence of an outer whorl of numerous, smaller subpetaloid staminodes, to only 1 mm, and an inner whorl of 10 petaloid staminodes, to 4–5 mm, around the stamens and ovary. Diels mentioned the similarities in the habit of *Sinia* with *Indovethia* Boerlage, a genus of Ochnaceae from Sumatra and Borneo. Both are erect, glabrous subshrubs with alternate leaves with glandulous-serrulate margins. He also described the differences in flower and inflorescence morphology between his new genus, *Indovethia*, and *Neckia* Korthals, the latter also from the Indo-Pacific region. In *Indovethia*, there are only 10 petaloid staminodes in two alternate whorls, whereas the flowers of *Neckia* have a whorl of numerous subpetaloid staminodes and 15 to 25 inner petaloid staminodes around the stamens and ovary. Diels did not compare *Sinia* with the genus *Sauvagesia* L., which at that time included only Neotropical species. Until recently, no good material of *S. rhodoleuca* had been collected. The original type material of *Sinia rhodoleuca* Diels in Berlin (holotype and paratype) was destroyed during World War II, and other herbaria (A, K) only have fragments of isotypes and isoparatypes; thus, the knowledge of the genus and its only species was primarily based on Diels's description (e.g., Kanis, 1968).

A phenetic analysis of *Sauvagesia* L. and related taxa by Sastre (1971) included the genus *Neckia* (together with *Lavradia* Vellozo ex Vandelli, *Leitgebia* Eichler, *Pentaspatella* Gleason, *Roraimanthus* Gleason, and *Vausagesia* Baillon) in *Sauvagesia* s.l. The characters of the staminodes in this broadly defined concept of the genus *Sauvagesia* vary from just five spathulate and small staminodia between the stamens (former genus *Leitgebia*) to numerous petaloid staminodes (former genus *Neckia*). Sastre (1971) did not include the genera *Indovethia* and *Sinia* in his analysis.

Based on a cladistic analysis of the Ochnaceae using morphological and anatomical characters (Amaral, 1991), the genus *Indovethia* was included in *Sauvagesia* s.l. This cladistic analysis did not include *Sinia* because no good material was then available for scoring most of the characters. However, Amaral (1991) suggested that very probably *Sinia* should also be included in *Sauvagesia*, because the flower morphology as described by Diels (1930) fits perfectly within the variation encountered in *Sauvagesia* s.l. Recent specimens collected for the *Flora of China* project have provided excellent material with flowers and ripe fruits, confirming that *Sinia* should

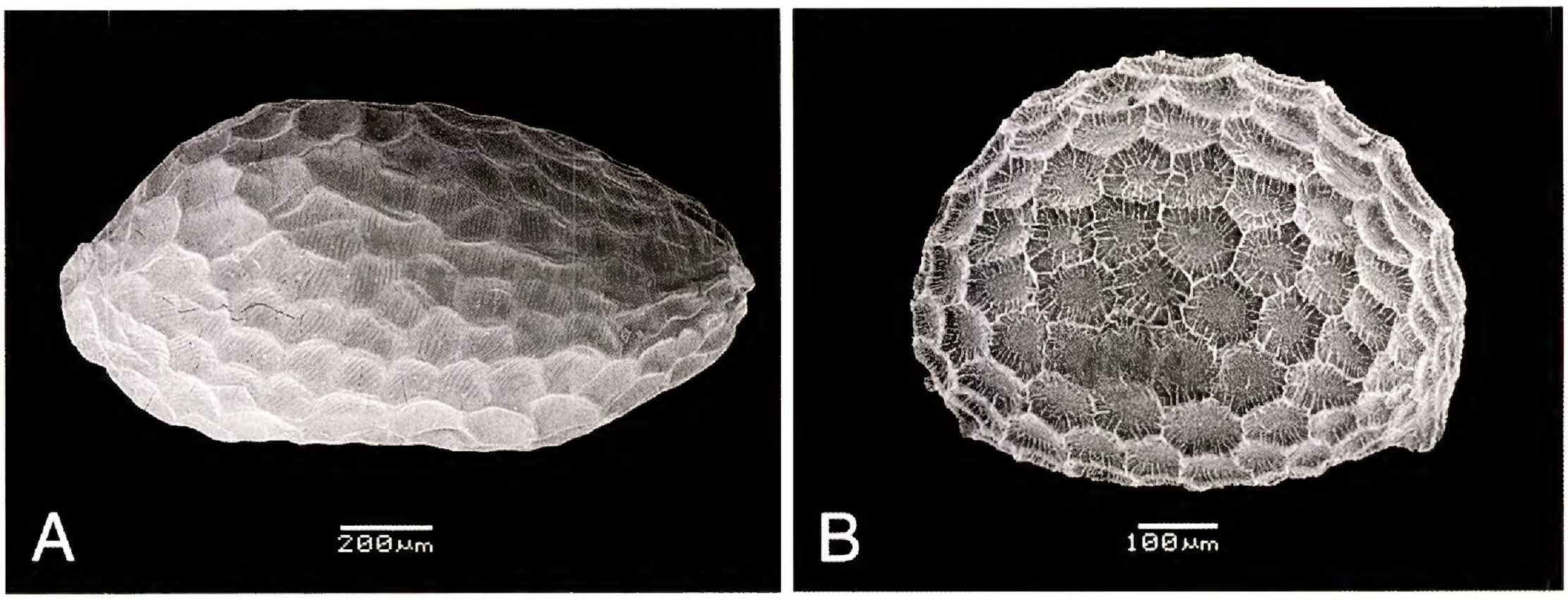

Figure 1. —A. *Sauvagesia rhodoleuca*, SEM of seed, *Wei Zhaofen 123213* (MO). —B. *Sauvagesia erecta*, SEM of seed, *C.G. Machado 22398* (UEC).

be included in *Sauvagesia*. Beyond the floral morphology, the ellipsoid and conspicuously areolate seeds are particularly characteristic of the genus *Sauvagesia*. Given this new information, a new combination is presented herein.

Sauvagesia rhodoleuca (Diels) M. C. E. Amaral, comb. nov. Basionym: *Sinia rhodoleuca* Diels, Notizbl. Bot. Gart. Berlin 10: 889. 1930. TYPE: "China meridionalis, Prov. Kwang si, in montibus Yaoshan, Lohsiang, 600–1000 m." *Sin 8197* (lectotype, designated here, SYS not seen, photo at P; isotype, K). Figure 1.

Specimens examined. Sauvagesia rhodoleuca: *Sin 8152* (paratype, B, destroyed, photo at A; isoparatypes, A, SYS not seen, photo at P); *Wei Zhaofen 123213* (MO); *Liu Yingguang 03049* (MO); *Huang Cheng 164390* (MO); *Tan Peixiang 58642* (MO); *Chen Guoqiang 50078* (MO); Guangdong Prov., *4774* (MO). *Sauvagesia erecta* L.: "Campinas, SP, Brazil," *C. G. Machado 22398* (UEC).

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Literature Cited

Amaral, M. C. E. 1991. Phylogenetische Systematik der Ochnaceae. Bot. Jahrb. Syst. 113: 105–196.

Diels, L. 1930. *Sinia. In:* Miscelania sinensia III. Notizbl. Bot. Gart. Berlin-Dahlem 10: 888–889.

Kanis, A. 1968. A revision of the Ochnaceae of the Indo-Pacific area. Blumea 16: 1–82.

Sastre, C. 1971. Essai de taxonomie numérique et schéma évolutif du genre *Sauvagesia* L. Sellowia 23: 9–44.

Validation of *Piper methysticum* var. *wichmannii* (Piperaceae)

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Abstract. Morphological, chemical, cytological, and genetic data have indicated that kava (*Piper methysticum* G. Forster, Piperaceae), a vegetatively propagated plant found only in cultivation, was derived from the wild *P. wichmannii* C. DC. through artificial selection, and that the two taxa remain similar enough to be considered conspecific. A previous attempt to recognize *P. wichmannii* (which may also be conspecific with *P. subbullatum* K. Schumann & Lauterbach) as a variety of *P. methysticum* was not validly published owing to failure to cite the place of publication of the basionym. The combination *Piper methysticum* var. *wichmannii* (C. DC.) Lebot is herein validated.

Key words: kava, New Guinea, *Piper*, *Piper methysticum*.

Piper methysticum G. Forster (Piperaceae), commonly known as kava, is cultivated for its kavalactone-containing roots, which are the source of a traditional beverage of the Pacific Islands, and more recently, of phytomedicinals used to alleviate anxiety. *Piper methysticum* is vegetatively propagated and sterile. Several lines of evidence indicate that it is derived from the wild *P. wichmannii* C. DC., which is occasionally cultivated as an inferior form of kava. *Piper wichmannii* is fertile and has longer inflorescences and woodier roots, but is otherwise morphologically very similar to *P. methysticum* (Lebot & Lévesque, 1989). Both taxa are decaploid ($2n = 130$; Lebot et al., 1991). *Piper wichmannii* is the only known wild taxon that contains significant quantities of kavalactones, as does *P. methysticum*, and some wild forms of *P. wichmannii* have a chemotype identical to that of certain *P. methysticum* cultivars (Lebot & Lévesque, 1996a). An isozyme study (Lebot et al., 1991) found no fixed differences between the two taxa; genetic diversity was limited, especially in *P. methysticum*. Representatives of *P. wichmannii* and *P. methysticum* from Vanuatu shared identical zymotypes (Lebot et al., 1991), supporting the hypothesis that cultivation of *P. methysticum* may have originated on Vanuatu.

According to Chew (1992), *Piper wichmannii* is among several taxa that should be placed in synonymy under *P. subbullatum* Lauterbach & K. Schumann based on morphological similarities. Gardner (2003) additionally placed the New Guinean *P. plagiophyllum* K. Schumann & Lauterbach (which has truncate rather than cordate leaf bases) in synonymy with *P. subbullatum*. Chew's treatment significantly expands the range of the wild progenitor of kava: while *P. wichmannii* has been reported only from New Guinea, the Bismarck Archipelago, the Solomon Islands, and Vanuatu, *P. subbullatum* sensu Chew, including *P. lageniovarium* C. DC., extends into Irian Jaya and the Philippines. However, no chemical or cytological studies of this assemblage are available, except for those that used material of *P. wichmannii*. The opinion that *P. subbullatum* sensu Chew represents a single species would, for example, be strengthened if kavalactones were discovered in a broader variety of populations.

In any case, *Piper methysticum* appears to be merely a form of *P. wichmannii* (which may or may not be conspecific with *P. subbullatum*) that has been modified through domestication and artificial selection. Thus, these taxa should be treated as a single species under *P. methysticum* (Forster, 1786), which name has priority over both *P. wichmannii* (Candolle, 1910) and *P. subbullatum* (Schumann & Lauterbach, 1900). Because differences in reproductive biology and phytochemical content are significant and of economic importance, a formal distinction between the wild and domesticated populations should be preserved. Lebot in Lebot and Lévesque (1996b: 782) therefore proposed the new combination "*Piper methysticum* var. *wichmannii*" to refer to the wild progenitor of kava. That combination was not validly published, because it did not include a "full and direct" reference to the place of valid publication of the basionym as required by Art. 33.3 of the ICBN

(Greuter et al., 2000). The same combination is validated below.

Piper methysticum G. Forster var. **wichmannii** (C. DC.) Lebot, comb. et stat. nov. Basionym: *Piper wichmannii* C. DC., Nova Guinea 8(Bot.) (2): 418. 1910. TYPE: New Guinea. West New Guinea: Côte du Nord, *Atasrip 39* [Exped. Wichmann] (holotype, L; isotype, BO, not seen).

Further synonymy, according to Chew (1972, 1992) and Gardner (2003), includes *Piper subbullatum* K. Schumann & Lauterbach, *P. plagiophyllum* K. Schumann & Lauterbach, *P. torricellense* Lauterbach in K. Schumann & Lauterbach, *P. grandispicum* C. DC., *P. lageniovarium* C. DC., *P. erectum* C. DC., *P. schlechteri* C. DC., *P. anisopleurum* C. DC., *P. pergrande* C. DC., and *P. arbuscula* Trelease. The present authors have not re-examined the types, but suggest that chemical and cytological data to support a broad circumscription would be desirable, most particularly where *P. lageniovarium* and *P. plagiophyllum* are concerned, as the former is geographically separated and the latter morphologically distinctive. As a side note, *P. methysticum* G. Forster has been identified as a later homonym of *P. methysticum* L. f., which, though intended to refer to kava, seems to have been mistakenly based upon material of *P. latifolium* L. f. However, Linnaeus *fils* (1781) corrected the name to *P. latifolium* in a page of emendations simultaneously published at the end of the volume, conceivably because he had discovered the error. Fosberg (1966) and Smith (1975) have plausibly argued that *P. methysticum* L. f. was not "accepted by the author in the original publication" as required by Art. 34.1 of the ICBN (Greuter et al., 2000) and thus was not validly published, so that no action to conserve *P. methysticum* in its universal meaning is required.

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Literature Cited

Candolle, A. C. P. de. 1910. Piperaceae. Nova Guinea 8(Bot.) (2): 415–422.

Chew, W.-L. 1972. The genus *Piper* (Piperaceae) in New Guinea, Solomon Islands, and Australia. I. J. Arnold Arbor. 53: 1–25.

———. 1992. Studies in Malesian Piperaceae II. Blumea 37: 159–164.

Forster, G. 1786. Florulae insularum australium: Prodromus. Joann, Christian Dietrich, Göttingen.

Fosberg, F. R. 1966. Systematic notes on Micronesian plants. 2. Phytologia 13: 233–241.

Gardner, R. O. 2003. *Piper* (Piperaceae) in New Guinea: The non-climbing species. Blumea 48: 47–68.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Lebot, V. & J. Lévesque. 1989. The origin and distribution of kava (*Piper methysticum* Forest. f., *Piperaceae*): A phytochemical approach. Allertonia 5: 223–280.

——— & ———. 1996a. Genetic control of kavalactone chemotypes in *Piper methysticum* cultivars. Phytochemistry 43: 397–403.

——— & ———. 1996b. Evidence for conspecificity of *Piper methysticum* Forst. f. and *Piper wichmannii* C. DC. Biochem. Syst. Ecol. 24: 775–782.

———, M. Aradhya & R. M. Manshardt. 1991. Geographical survey of genetic variation in kava. Pacific Sci. 45(2): 169–185.

Linnaeus, C. 1781. Supplementum plantarum Systematis vegetabilium editionis decimae tertiae, Generum plantarum editionis sextae, et Specierum plantarum editionis secunda. Impensis Orphanotrophei, Braunschweig.

Schumann, K. & K. Lauterbach. 1900. Die Flora der Deutschen Schutzgebiete in der Südsee. Gebrüder Borntraeger, Leipzig.

Smith, A. C. 1975. The genus *Macropiper* (Piperaceae). Bot. J. Linn. Soc. 71: 1–38.

The Esparto Grass Question: A Systematic Approach for a Long-Lasting Problem in *Stipa* L. (Gramineae)

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Abstract. The systematic diversity within the esparto grass has produced controversy since the first century AD regarding the varying quality of this natural product as textile material. Investigated herein is *Stipa* subg. *Macrochloa* (Kunth) Barreña, D. Rivera, Alcaraz & Obón. Two species, *Stipa antiatlantica* and *S. tenacissima*, as well as two subspecies within *S. tenacissima* are recognized. *Stipa kralifii* is newly synonymized with *S. tenacissima* subsp. *gabesensis*. A dichotomous key is presented for identification of the taxa.

Resumen. La diversidad sistemática del esparto ha dado lugar a diversas controversias sobre la diferente calidad como material textil de este producto natural, desde el siglo I AD. Se investiga el género *Stipa* subgénero *Macrochloa* (Kunth) Barreña, D. Rivera, Alcaraz & Obón. Se reconocen 2 especies, *Stipa antiatlantica* y *S. tenacissima*, así como dos subspecies dentro de *S. tenacissima*. Se incluye *Stipa kralifii* nuevamente en sinonimia con *S. tenacissima* subsp. *gabesensis*. Se presenta una clave dicotómica para la identificación de los taxones.

Key words: esparto grass, Mediterranean flora, Poaceae, *Stipa tenacissima*.

Pliny (Rackham, 1971) wrote in his *Natural History* (first century AD) about esparto grass (also called alfa grass, halfa grass, and Spanish grass) as a valuable product of the southeastern Iberian Peninsula, which was exclusive to this part of the Mediterranean Region. Pliny also stated that a smaller and unprofitable type occurred in Africa. Esparto became at that time a strategic good because its fibers are extremely resistant to rotting in sea water. Therefore, esparto ropes and cordage are excellent for maritime vessels, and they constituted an invaluable product for commercial and military fleets. The most suitable esparto plants were confined to a 30 × 100 square-mile area near Cartagena (Spain) according to Pliny (Rackham, 1971). The best grade of esparto grass is known as Spanish, while the cheaper African grade is called Tripoli, referring to the capital city of Libya (Roberts & Etherington, 1994). Thus, Spanish *Stipa tenacissima* constitutes the best, main source of esparto fiber. The generic name *Stipa* was coined by Linnaeus and was assumed to come from Latin *stuppa* (tow), from the Greek *stuppeion* or *stuppe* (coarse fiber of flax or hemp, tow, oakum), perhaps alluding to plumose awns forming feathery inflorescences or, most likely, to the fiber obtained from esparto grass [Latin *stuppa* produced *estopa* in Spanish, *étoupe* in French, and *stupe* in English] (Fowler et al., 1990; Gaffiot, 1984; Hitchcock, 1925; Liddell & Scott, 1996, Rivera & Obón, 1991; Watson & Dallwitz, 2003).

Introduced in England in 1850 by T. Routledge, esparto fiber was used extensively in Great Britain, but was seldom employed in the United States, principally due to the cost of transporting the grass or pulp made from it. In England, it is employed in the production of better grades of book paper. The presence of esparto fiber in paper is determined by an iodine-zinc chloride test, which stains deep violet, or by boiling the specimen in a 1% solution of aniline sulfate, which turns the paper pink in the presence of the grass (Roberts & Etherington, 1994).

Stipa tenacissima L., which traditionally belongs within the genus *Stipa* L., has an Iberian–North African distribution, growing in semi-arid and dry climates, extending to the Balearic Islands. In the Iberian Peninsula, the taxon occurs in the central, eastern, and southeastern regions, although populations also occur scattered along the Algarve region in Portugal. It has been reported from Ibiza and Menorca in the Balearic Islands (Pereira, 1974; Vázquez & Devesa, 1996). In northern Africa *S. tenacissima* extends from southwestern Morocco to Khoms in western Libya; its southern distributional limit is the

northern edge of the Sahara desert (Abdelkrim & Bensettiti, 1988; Le Houérou, 1959a, b; Maire, 1953; Walter, 1977). This taxon is not represented either in Turkey or Cyprus; citations from there (Bor, 1985; Scholz, 1985) are a consequence of misidentifications.

Some authors mistakenly identified "albardin" or "false esparto-grass" from Spain as *Stipa tenacissima* (Zeven & de Wet, 1982). "Albardin" is the common name in Spanish for the monotypic genus *Lygeum* Loefling ex L. (1754), i.e., *Lygeum spartum* L., also esteemed as a fiber plant (Rivera & Obón, 1991). Although taxomomically distant (*Lygeum* belongs to the tribe *Lygeeae* J. Presl), false and true esparto grass are often confused because of their similar uses and their partly sympatric distribution.

The genus *Macrochloa* Kunth comprised only two species: *Macrochloa arenaria* (Brotero) Kunth [= *Stipa gigantea* Link] and *M. tenacissima* (Loefling ex L.) Kunth. Subsequently, it was submerged within *Stipa* by Steudel (1854), but there is a problem in interpreting Steudel's infrageneric taxa as subgenera or sections because of his inconsistent use of rank. The uncertain use of the double SS as a symbol for infrageneric supraspecific taxa by Steudel (1854) cast doubt on their circumscription, and traditionally these have been considered unranked. Pfeiffer's (1873–1874) index of names of taxa above the rank of species accepts Steudel's infrageneric taxa in *Stipa* as sections, but that interpretation seems arbitrary. Did Pfeiffer actually make the infrageneric combination at the rank of section? It has been suggested to us (Jerrold I. Davis, pers. comm.) that it should be considered as *Stipa* sect. *Macrochloa* (Kunth) Pfeiffer. This has been adopted by Vázquez and Devesa (1996), who combined *Macrochloa* at the rank of section within *Stipa*, including in its synonymy the combination by Steudel at the rank of subgenus. Thus, we have several alternative combinations available, but all doubtful. Freitag (1985) considered *Macrochloa* somewhat isolated within *Stipa*. The type species of section *Macrochloa* was formally designated by Vázquez and Devesa (1996) *Stipa tenacissima* L., and they excluded *Stipa gigantea* Link from this section.

Raffaelli and Ricceri (1989) described three new species (all within the limits of subg. *Macrochloa*) from Tunisia (*Stipa gabesensis* Moraldo, Raffaelli & Ricceri, *S. kelibiae* Moraldo, Raffaelli & Ricceri, and *S. kralifii* Moraldo, Raffaelli & Ricceri). These three species were distinguished using characters such as the presence of trichomes on the palea, glume type (entire or 2-cleft), length of the lobes of the ligules, shape of the leaves (strongly recurved or not), length of the lobes of the lemma, shape of the lodicules, and diameter of the cauline leaves, among others. Vázquez and Devesa (1996) did not accept most of these characters as useful for the subgenus. The descriptions by Raffaelli and Ricceri (1989) had been based on relatively few specimens but these were enough to raise the question of the homogeneity of the subgenus. For this reason, we analyzed the subgenus in its entirety, covering its entire geographic range.

Material and Methods

We analyzed material from 108 populations of *Stipa* subg. *Macrochloa* from the Iberian Peninsula and Balearic islands (74), and North Africa (34) [specimens collected by us or received on loan for study from ABH, BM, COI, FI, G, LINN, MA, MAF, MUB, RNG, RO, UMH; see Appendices 1, 2], to look for differences among them. Secondly, we examined variability within the taxa, testing also the status of the recently described species (Raffaelli & Ricceri, 1989).

Complete, mature specimens were used for the analysis. Incomplete herbarium specimens were also of great utility when checking the localities of the most significant populations and for broadly defining the geographical range and morphological variability within subgenus *Macrochloa* as a whole. Type specimens were consulted as available. The type specimen of *Stipa tenacissima* L. (LINN 94.7) was studied, but it was not included in our numerical analysis. Nevertheless, its attributes were checked against the results of numerical studies to establish which infrageneric group it belonged to. Linnaeus described the species using mostly plant material collected by Loefling from the vicinity of Madrid, Spain; thus, we paid particular attention to populations from this area (Vázquez et al., 1995).

We failed to obtain a loan of the holotype specimens of *Stipa gabesensis*, *S. kelibiae*, and *S. kralifii*, which were not found at the herbarium FI in 2000 and 2001. Rather, we did receive most of the material available at FI of these taxa, including isotypes. Surprisingly, a detailed description of the sheets containing the holotypes is given by Vázquez and Devesa (1996) with the correlative numbers of loan from the herbarium FI (3016/1 to 3). Were these never returned to FI? Thus, for the above taxa we only considered the diagnoses and other specimens from the type localities, viz. topotypes. We received from P. Cuccini (FI) negatives of one specimen from Libya (*Pampanini 679*) determined as *Stipa gabesensis* by Raffaelli and Ricceri. Jaakko Nurmi of the Finnish Museum of Natural History extensively and carefully searched for us the type material of *Stipa tenacissima* var. *villosiuscula* Lindberg in H.

The plant material proceeds in part from herbarium loans, although our own gatherings and observations

were also made in the field. Anatomical studies followed the approach of Renvoize (1985), considering especially leaf vasculature of the subsidiary bundles below secondary bundles in transverse blade sections. The measurements and states observed in each sheet were analyzed using the package Syntax 5.1 (Podani, 1994).

Results and Discussion

Diagnostic characters are summarized in Tables 1 and 2. During our study, taxonomic characters and/or new character-states were confirmed or discovered. For example, it was observed that in the character conforming to the indument of the palea there is a continuous gradient from glabrous to pubescent (Table 2). The presence of long trichomes on and between the adaxial ribs constitutes the most consistent character, although individuals lacking trichomes also appear, even within the same population, and some displayed only scattered trichomes near the apex of the palea (Fig. 1). Other characters, such as the type of glume apex (entire vs. bifid), do not appear to be of taxonomic value because the whole range of variability may be detected within the same specimen, occurring in populations from Toledo, Spain, and Djebel Nafousah, Libya.

Table 1 summarizes those characters that distinguish *Stipa* subg. *Macrochloa* from subgenus *Jarava* and sections of *Stipa* subg. *Stipa*. It should be noted that *Stipa* sect. *Giganteae* comprises the remaining species of two included by Kunth (1829) in genus *Macrochloa*: *Stipa gigantea* Link (in J. Bot. (Schrader) 2: 313. 1799) [= *Macrochloa arenaria* (Brotero) Kunth].

The membranous ligule being replaced with trichomes is the most distinctive character for *Stipa* subg. *Macrochloa*. Geniculate awns with plumose columns, anthers with long lax trichomes (shared only with *Stipa* sect. *Giganteae*), and leaves with subsidiary vascular bundles are further characters relevant for this group (Table 1).

The variability within subgenus *Macrochloa* is well described with two characters: the indument of the palea apex and the indument of the upper third of the leaf sheath. Other useful characters to mention are the leaf type, awn length, length of the column of the awn, as well as the length of the seta of the awn, respectively (Table 2). The remaining characters have lesser relevance to the taxonomy of the group.

The first specimen group of esparto grass, *Stipa antiatlantica*, is characterized by the pubescence on the upper third of the leaf sheaths (Fig. 1a), a character that is unique within *Stipa* subg. *Macrochloa* (Table 2), as well as the palea covered throughout with long trichomes (Fig. 1b). This group was found in populations from the southern High Atlas, Anti-Atlas, Mogador, and Agadir in Morocco. The presence of scattered trichomes on the palea (Fig. 1c) characterizes a second specimen group, *S. tenacissima* subsp. *gabesensis*, whereas the leaf sheath is glabrous. This was found in populations from eastern Algeria, most of Tunisia, and western Libya (Fig. 2), as well as one specimen from Benisicar, Morocco. The third specimen group comprises the type material of *S. tenacissima*, from the outskirts of Madrid, Spain, and similar populations (Fig. 2) with both the palea and leaf sheath glabrous (Fig. 1d, f). The populations of Algarve, Portugal, and the Balearic Islands seem to represent an intermediate variant of the second group above, with a few scattered trichomes near the tip of the palea (Fig. 1e).

Therefore, it is necessary to recognize that *Stipa* subg. *Macrochloa* consists of three fairly homogeneous groups. Each one of these occurs in a well-defined distribution area (Fig. 2) and displays a number of constant characteristics. The overall variability is relatively small, and the characters involved mainly pertain to the type of indument. We recognize two groups as clearly distinct at the species level; within one of these we recognize two distinct groups at subspecies rank (Table 2). The level of species given by authors such as Raffaelli and Ricceri (1989) for *S. kralifii*, *S. gabesensis*, and *S. kelibiae* should be discarded.

Stipa antiatlantica is endemic to southern Morocco (Fig. 2). Within *S. tenacissima*, the typical subspecies has the largest extent, covering most of the species' area (Fig. 2). Most of the populations of *S. tenacissima* subsp. *tenacissima* have been established under cultivation, especially in the eastern Iberian Peninsula. The second subspecies, *S. tenacissima* subsp. *gabesensis*, is confined to the eastern range of the species' distribution (Fig. 2). The entire subgenus, *Stipa* subg. *Macrochloa* is endemic to the western Mediterranean region (Fig. 2).

Taxonomic Treatment

Stipa L. subgen. **Macrochloa** (Kunth) Barreña, D. Rivera, Alcaraz & Obón, comb. et stat. nov. Basionym: *Macrochloa* Kunth, Révis. Gram. 1: 58. 1829. *Lasiagrostis* sect. *Macrochloa* (Kunth) Trinius & Ruprecht, Spec. Gram. Stirp. 1: 94. 1842. *Stipa* sect. *Macrochloa* (Kunth) [Steudel ex] Pfeiffer, Nomenclator Botanicus 1: 132. 1873–1874. [*Stipa* (unranked) *Macrochloa* (Kunth) Steudel, Syn. Pl. Glum. 1: 132, 1854.] TYPE: [Spain] *Macrochloa tenacissima* (Loefling ex L.) Kunth, lectotype, designated by Hitchcock, Contrib. U.S. Nat. Herb. 24(7): 216. 1925.

Table 1. Comparison of infragenera within *Stipa* L. The diagnostic characters of *Stipa* sensu stricto in South America, Africa, and the Mediterranean region (Caro & Sánchez, 1973; De Winter, 1965; Freitag, 1985; Hitchcock, 1925; Maire, 1953; Moraldo, 1986; Renvoize, 1985; Tovar, 1993; Vázquez & Devesa, 1996). References for basic chromosome numbers: Vázquez and Devesa, 1996.

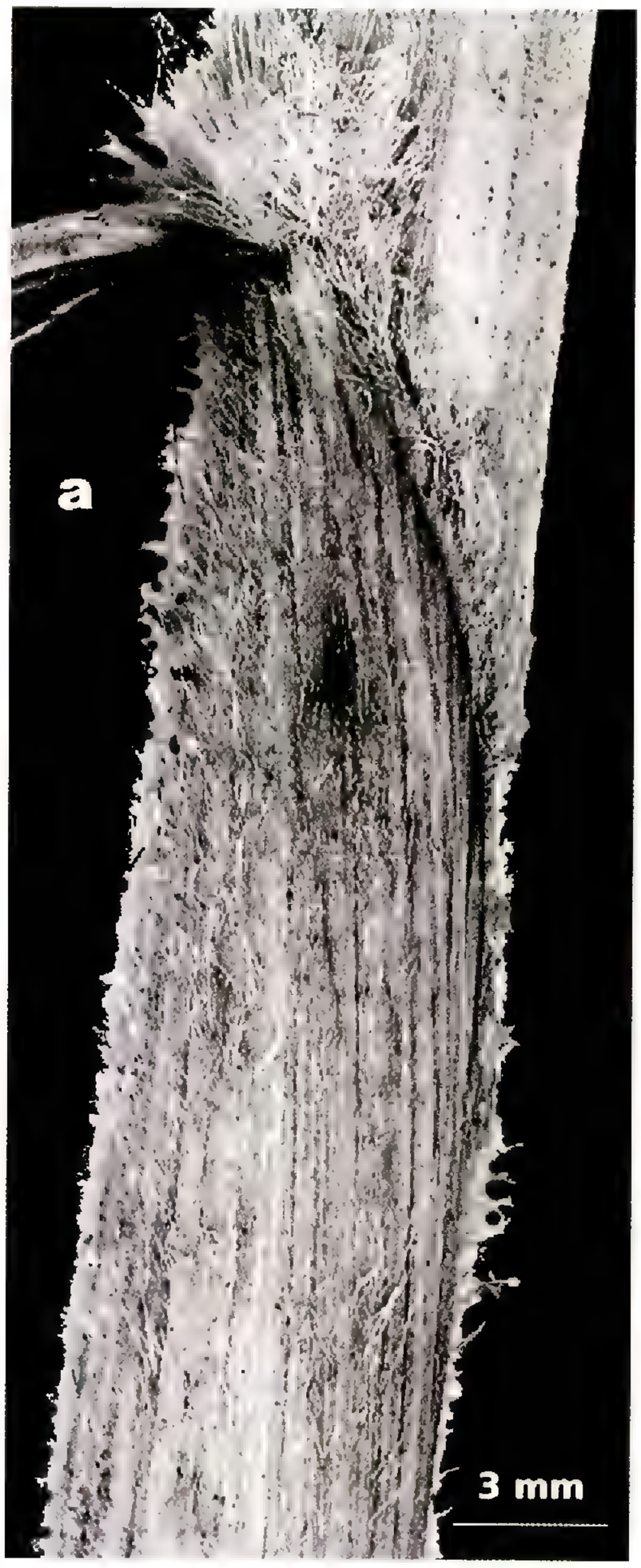
Subgenera	*Macrochloa*	*Jarava*	*Stipa*							
Sections	*Macrochloa*	*Jarava*	*Ptilagrostis*	*Giganteae*	*Stipa*	*Leiostipa*	*Barbatae*	*Inaequiglumis*	*Stipella*	*Aristella*
Habit	perennial cespitose	perennial cespitose	perennial cespitose	perennial cespitose	perennial cespitose	perennial cespitose	perennial cespitose	perennial cespitose	annual cespitose	perennial stoloniferous
Ligules	replaced by trichomes	membranous	membranous, ciliolate	membranous	membranous	membranous	membranous	membranous	membranous	membranous
Glumes	subequal	subequal	subequal	subequal	subequal	subequal	subequal	dissimilar	subequal	subequal
Lemmas	bifid	entire	obscurely bilobed	bifid	entire	entire	entire	entire	entire	notched
Indument	uniformly pubescent	summit bearing trichomes 3–4 mm long	uniformly pubescent	uniformly pubescent	7 ranks of trichomes	7 ranks of trichomes	7 ranks of trichomes	uniformly pubescent	uniformly pubescent	adpressed trichomes
Callus	acute	—	obtuse	acute	acute	acute	acute	acute	acute	obtuse
Awns	geniculate	once-twice geniculate	slightly twisted	twice geniculate	twice geniculate	twice geniculate	twice geniculate	twice geniculate	twice geniculate	straight, not geniculate
Columns	plumose	scabrous	scabrous	scabrous	glabrous	scabrous or pubescent < 0.5 mm	scabrous	scabrous or pubescent < 0.5 mm	scabrous or pubescent < 0.5 mm	pubescent < 0.5 mm
Setae	scabrous	scabrous	scabrous	scabrous	plumose	scabrous or with trichomes < 0.5 mm	pubescent	scabrous or with trichomes < 0.5 mm	scabrous or with trichomes < 0.5 mm	pubescent with trichomes < 0.5 mm
Paleas	entire	entire	entire	bifid	entire	entire	entire	entire	entire	entire
Anthers	tips provided with tufts of long soft trichomes	—	glabrous	tips provided with tufts of long soft trichomes	glabrous	glabrous	glabrous or with trichomes	glabrous	glabrous	glabrous
Subsidiary bundles	present	lacking	lacking	lacking?	lacking	lacking	lacking	lacking	lacking	lacking
Styles	2	—	—	2	2	2, 3, or 4	2	2	2	2
N° basic	$x = 12$	$x = 11$	$x = 12$	$x = 12$	$x = 11$	$x = 11$	$x = 11$	$x = 7$	$x = 12$	$x = 7$

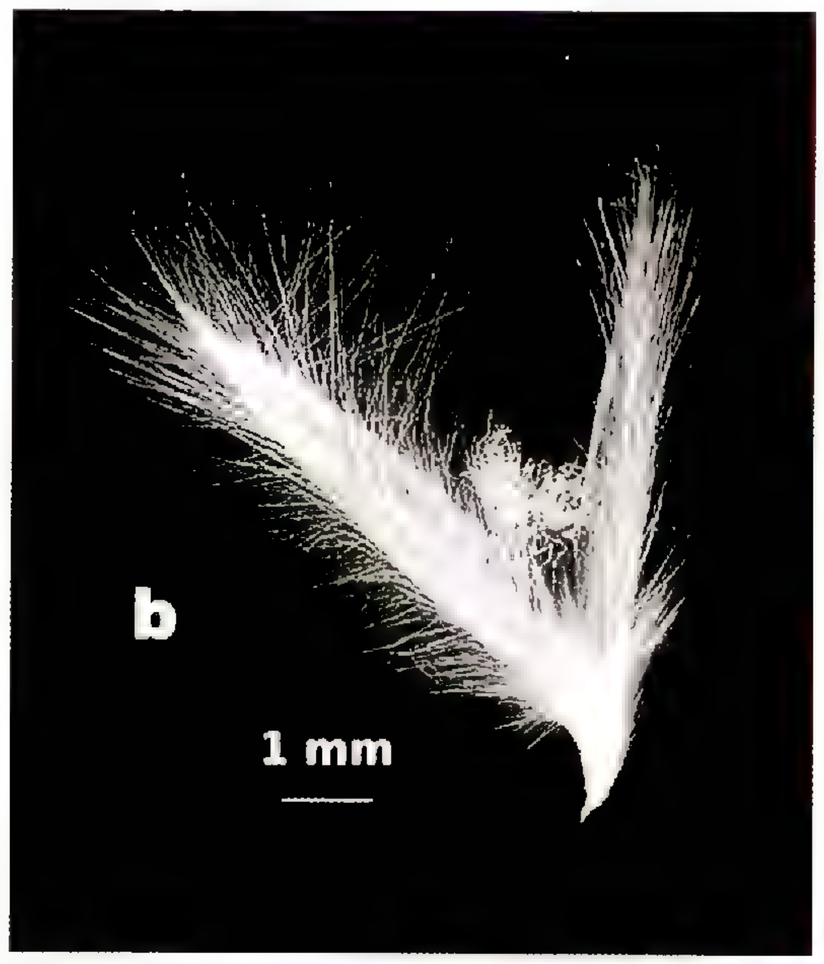
Table 2. Morphological comparison of characters and character-states for the species and subspecies within *Stipa* subg. *Macrochloa*.

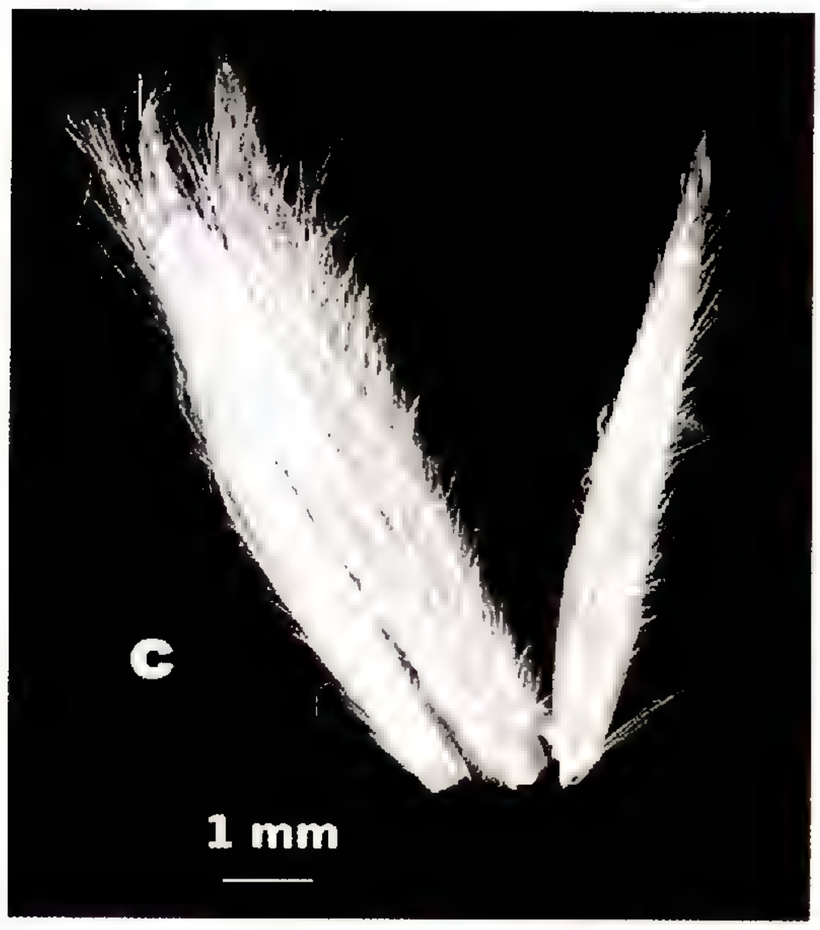
Characters	*Stipa antiatlantica*	*S. tenacissima* subsp. *tenacissima*	*S. tenacissima* subsp. *gabesensis*
Culm length (cm)	20–155	20–180	45–135
Length of the upper glume (mm)	22–26	21–25	23–26
Length of the lower glume (mm)	25 29	24–30	25–29
Length of the lemma (mm)	8.0–9.2	9.2–10.3	8.8 -9.8
Length of the apical lobes of the lemma (mm)	1.0–2.4	1.6–2.2	1.6–2.2
Length of the palea (mm)	7.5–9.0	8.5–9.4	7.5–8.3
Length of the awn (mm)	55–59	47–57	58–73
Length of the column of the awn (mm)	14–15	14–17	19–24
Length of the seta of the awn (mm)	41–46	33–40	39–50
Indument of the upper third of the leaf sheath	pubescent	glabrous	glabrous
Type of leaves	not bent (strict)	bent or not	not bent (strict)
Type of inflorescence	broadly lanceolate	broadly lanceolate to spindle shaped	broadly lanceolate
Indument of the apex of the palea	pubescent	glabrous	pubescent
Rows of trichomes on abaxial ribs of the palea	present	lacking	present
Trichomes between abaxial ribs of the palea	present	lacking	present

Note: Values were assembled from one data matrix of 40 selected specimens × 18 characters and from the type collection study. Some of the specimens used are: *Stipa antiatlantica* (*Charpin, Fdez. Casas, Jacquemoud & Jeanmonod MAR 275* (G, MA), *Podlech 42788* (G), *P. & J. Davis s.n.* (BM)), *S. tenacissima* subsp. *tenacissima* (*Loefling s.n.* (LINN), *Rivera s.n.* (MAF), *García s.n.* (MUB), *Navarro & Sánchez s.n.* (MAF)), *S. tenacissima* subsp. *gabesensis* (*Davis 49705* (RNG), *Davis 49797* (RNG)).

Perennial, densely caespitose; culms 20–180 cm high, herbaceous, unbranched above, 2- to 4-noded; culm nodes violet tinged and pubescent; culm internodes solid; young shoots intravaginal. Leaves mostly basal, auriculate; sheaths glabrous or pubescent; ligule replaced by a pair of trichome tufts, 2–4 cm long on the basal leaves, 1–2 cm long on the upper leaves; leaf blade linear, narrow, strict, or bent, convolute, abaxially glabrous and adaxially pubescent, (0.4)1.0–1.5(2.4) mm wide. Plants bisexual, with bisexual spikelets; with hermaphrodite florets. Inflorescence contracted, paniculate, lanceolate or spindle shaped, 30–40 cm long, not deciduous, with 10 to 30 branchlets and 30 to 80 spikelets, spatheate; spikelet-bearing axes persistent, pubescent, with 1 to 7 spikelets each. Spikelets not secund, pedicellate; bisexual spikelets disarticulating above the glumes; spikelets with hermaphrodite florets only, without proximal incomplete florets. Hermaphrodite florets 1. Pubescent callus present, the callus trichomes white; callus (1.5)1.8–2.1(2.9) mm long, pointed. Glumes two, subequal; upper glume (18)21–26(31) mm and lower glume (20)24–30(39) mm; long relative to the adjacent lemmas, pointed, with long acuminate apices, glabrous, entire, with pubescent veins; lower glume 3(to 5)-nerved; upper glume (3- to)5-nerved. Lemmas lanceolate, (7.0)8.7–10.3(13.2) mm, convolute, subtending the palea, not saccate, without a crown, decidedly firmer than the glumes, usually 2-lobed, lobes (0.8)1.6–2.4(3.5) mm; lemmas pubescent (the trichomes usually ascending, diffuse or in longitudinal ranks), terete and non-carinate, having the margins lying flat on the palea, 3- to 5-nerved; awns 1, from a sinus, geniculate, long plumose, much longer than the body of the lemma, (3.6)4.7–7.3(8.8) cm, entered by several veins arising from the lemma, persistent (but usually jointed at the base); awn bases twisted; awn column with patent trichomes and the seta with short adpressed trichomes; palea subequal and slightly shorter than the lemma, tightly enclosed by the lemma, entire or slightly cleft, awnless, without apical setae; thinner than the lemma, not indurate, 2-nerved, free, palea glabrous, or unevenly pubescent, (7.0)7.5–9.5(12.7) mm; lodicules 3, free, membranous, the anterior usually somewhat different, generally larger, (0.7)1.8–2.2(3.1) mm long; stamens 3, anthers 5–10 mm long, penicillate; ovary glabrous; styles free to their bases; stigmas 2, white. Chasmogamous. Caryopsis free from both lemma and palea, 4–18 mm long, linear, or fusiform, not grooved, compressed laterally; hilum long-linear. Seedling with either a short or long mesocotyl; first seedling leaf with a well-developed lamina, this lamina narrow, erect, 3- to 5-veined.







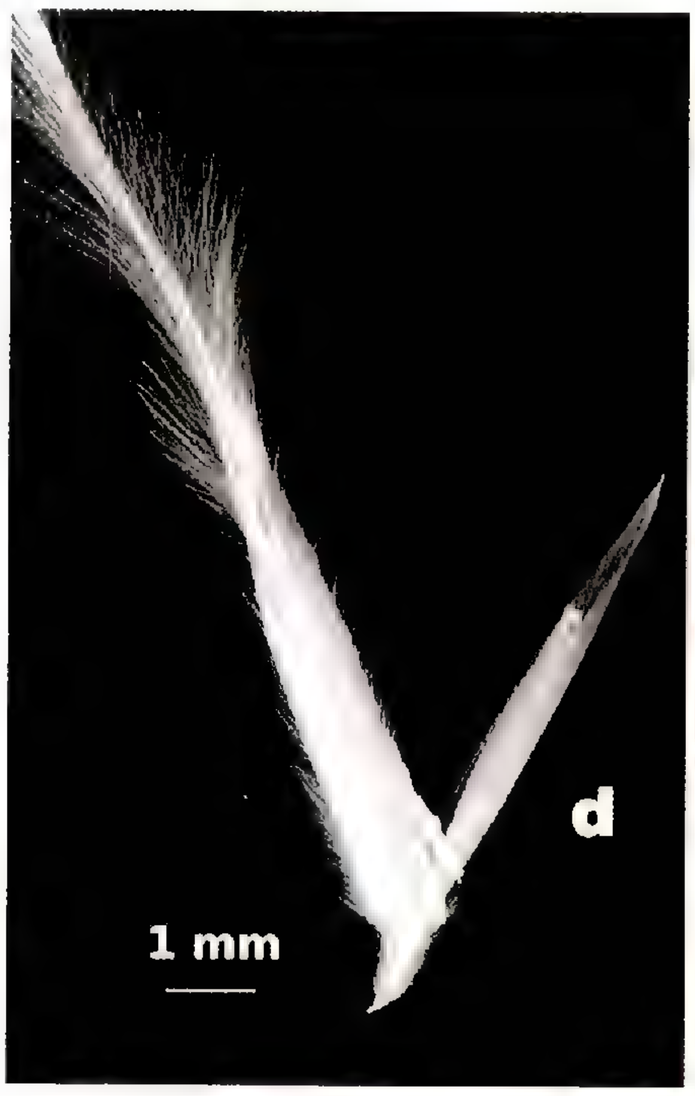


Figure 1. —a. *Stipa antiatlantica*. Pubescence on the upper third of the leaf sheaths. —b. *S. antiatlantica*. Pubescent back of the lemma and pubescent palea with long trichomes. —c. *S. tenacissima* subsp. *gabesensis*. Pubescent back of the lemma and pubescent palea with scattered trichomes. —d. *S. tenacissima* subsp. *tenacissima*. Pubescent back of the lemma, palea glabrous. —e. *S. tenacissima* subsp. *tenacissima*. Pubescent back of the lemma, palea glabrous with some trichomes near the apex. —f. *S. tenacissima* subsp. *tenacissima*. Upper part of the glabrous leaf sheath.

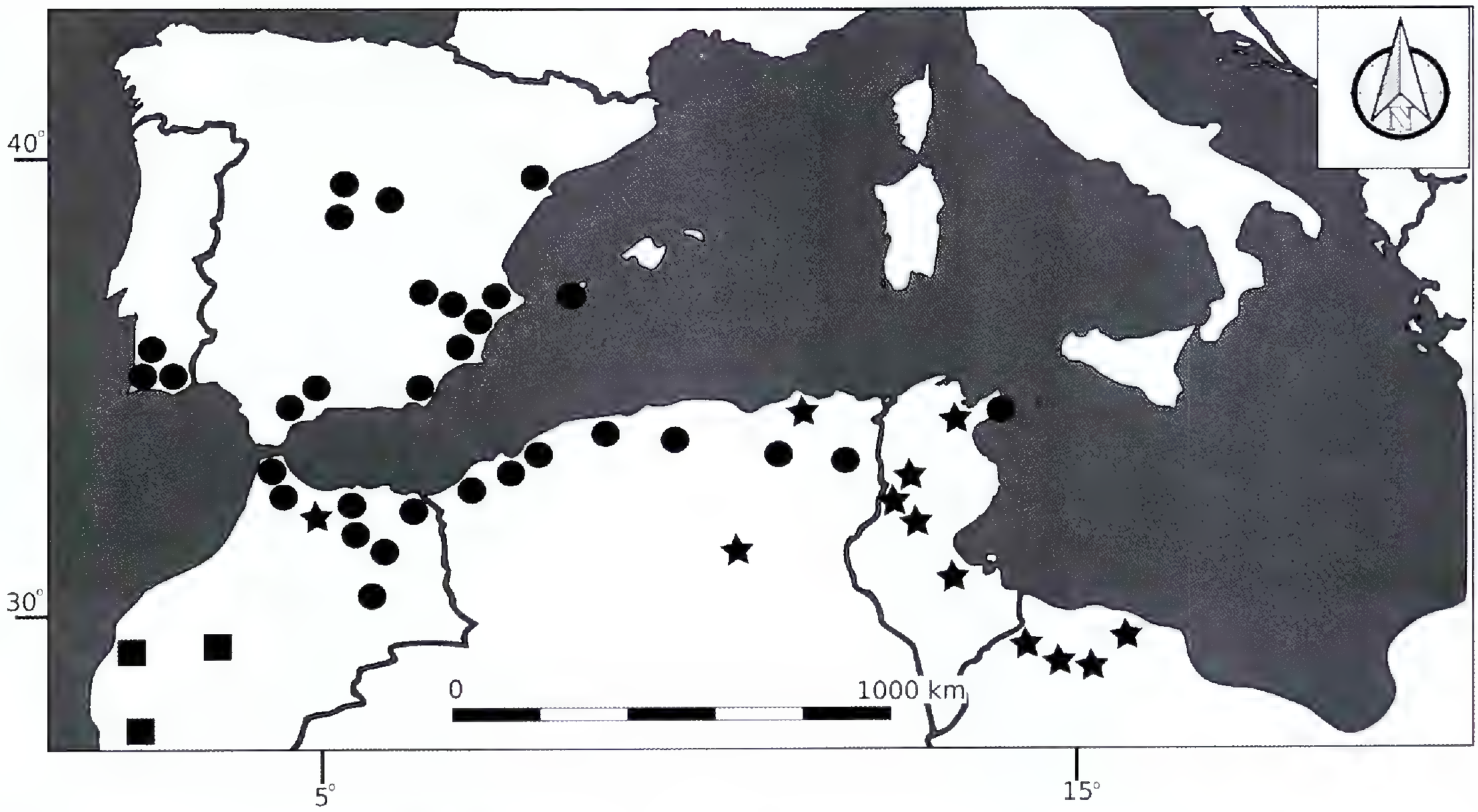


Figure 2. Distribution map. *Stipa antiatlantica* (■). *S. tenacissima* subsp. *tenacissima* (●). *S. tenacissima* subsp. *gabesensis* (★).

Chromosome number. The base chromosome number of *Stipa* L. subgen. *Macrochloa* is $x = 6$ (Abdelkrim & Bensettiti, 1988) [unlikely] or $x = 12$ (Vázquez & Devesa, 1996), 10, or 11. In the hexaploid case, the basic chromosome number of *Stipa tenacissima* subsp. *gabesensis* is 12, thus similar to that of the typical subspecies, but differing from the basic chromosome number of 11 for *S. antiatlantica*, and 10 for Portuguese (Algarve) individuals of *S. tenacissima*. The chromosome base numbers for genus *Stipa* are $x = 9$, 10, 11, or 12 (Hilu, 2004; Watson & Dallwitz, 2003), with sporophytic counts = 22 [putative diploids] [*S. lagascae* Roemer & Schultes, Devesa et. al. 1991, *S. sibirica* (L.) Lamarck, Stepanov, 1994], 24 [*S. bromoides* (L.) Döerfler, Strid & Andersson, 1985], 28 [*S. parviflora* Desfontaines, Vazquez & Devesa, 1996], 36 [putative triploids] [*S. capensis* Thunberg, Vázquez & Devesa, 1996], 40 [putative tetraploids] [*S. coronata* Thunberg, Reeder, 1984], or 44 [*S. barbata* Desfontaines, Vázquez & Devesa, 1996] (with 44 most often), 66 [putative hexaploids] [*S. epilosa* Martinovsky, Kozuharov & Petrova, 1991] and 96 [putative octoploids] [*S. gigantea* Link, Vázquez & Devesa, 1996]; the chromosomes are small to medium sized; nucleoli are reported to disappear before metaphase (Hilu, 2004; Watson & Dallwitz, 2003). The chromosomal diversity in *Stipa* represents speciation enhanced by various levels of euploidy and aneuploidy (Hilu, 2004).

Micromorphology. Leaf blade with distinct, prominent adaxial ribs, with the ribs very irregular in size. Midrib not readily distinguishable, with one bundle only, without colorless mesophyll adaxially. Mesophyll with non-radiate chlorenchyma, without adaxial palisade. The lamina symmetrical on either side of the midrib. All the vascular bundles accompanied by sclerenchyma. Sclerenchyma not all bundle-associated. Additional sclerenchyma in a continuous abaxial layer, joining the bundles. A single pair of subsidiary bundles present below the secondary bundles in *Stipa tenacissima* subsp. *gabesensis* from Libya and Tunisia, with two pairs in *S. tenacissima* subsp. *tenacissima* from Spain. Outer sheath cells usually smaller than chlorenchyma cells, their walls much thickened. Inner sheath composed of small cells with conspicuously thickened walls.

Esparto fibers have thick walls and are short, normally less than 3 mm in length, with an average length of 1.5 mm. The fiber diameter varies from about 5–15 µm, with an average of about 12 µm. The fibers also tend to be curved and twisted.

Most of Steudel's infrageneric taxa and all in *Stipa* are unranked, but these were assigned sectional rank by Pfeiffer (1873–1874). Due presumably to the difficult interpretation of Steudel's and Pfeiffer's infrageneric ranks, Vázquez and Devesa (1996: 21) invalidly combined *Macrochloa* as section of *Stipa* (nom. superfl.).

Key to the Species and Subspecies of Esparto Grass (*Stipa* subg. *Macrochloa*)

1a. Sheaths glabrous or, rarely, having a slightly harsh surface in the upper third (scabrous); paleas glabrous or pubescent throughout 2
  2a. Paleas glabrous or with a dorsal line of trichomes; awns 47–57(88) mm *Stipa tenacissima* subsp. *tenacissima*
  2b. Paleas pubescent throughout; awns (15–) 58–73(–88) mm . . *Stipa tenacissima* subsp. *gabesensis*
1b. Sheaths distally pubescent; paleas pubescent throughout . . . . . *Stipa antiatlantica*

1. Stipa tenacissima Loefling ex L., Cent. Pl. I: 6. 1755. *Macrochloa tenacissima* (Loefling ex L.) Kunth, Revis. Gram. 1: 58. 1829. *Lasiagrostis tenacissima* (Loefling ex L.) Trinius & Ruprecht, Spec. Gram. Stirp. 1: 94. 1842. TYPE: [Spain] "Habitat in Hispaniae collibus sabulosis" and "Bauh. Pin.5...Clusii hist. 2 p. 220" *Loefling s.n.* (lectotype, designated by Vázquez et al., Anal. Jard. Bot. Madrid 52 (2): 184–185, 1995; LINN 91.7).

1a. Stipa tenacissima subsp. **tenacissima**.

Stipa kelibiae Moraldo, Raffaelli & Ricceri, Candollea 44: 80. 1989. TYPE: [Tunisia] "betw. Kelibia & El-Haouaria, 30 m, 13 Apr. 1986," *M. Raffaelli & C. Ricceri, s.n.* (holotype, FI 3016/2 not seen; isotype, FI).

Leaf sheaths glabrous (Fig. 1f) or, rarely, having a slightly harsh surface in the upper third (scabrous); ligule replaced by a pair of trichome tufts, basal leaves 2–4 cm long, upper leaves 1–2 cm long. Leaf blade linear, narrow, strict, convolute, abaxially glabrous and adaxially pubescent, (0.6)1.3–1.5(2.0) mm wide. Inflorescence contracted, paniculate, lanceolate or spindle shaped, 30–40 cm long, not deciduous, with 15 to 30 branchlets and 40 to 80 spikelets, spatheate. Glumes 2, subequal; upper glume (18)21–25(31) mm, lower glume (21)24–30(39) mm, glabrous, entire, with pubescent veins; lemmas lanceolate, (7.0)9.2–10.3(13.2) mm, lobes (1.0)1.6–2.2(3.5) mm, pubescent; lemma awns 1, (36)47–57(88) mm; palea (7.0)8.5–9.0(12.7) mm, glabrous (Fig. 1d), or partially pubescent at the apex (Fig. 1e), or sparsely pubescent adaxially.

Illustration. Tab. 30 in Desfontaines (1798); figure 3 in Raffaelli and Ricceri, 1989: 81.

Chromosome number. [Sporophytic ?] 12 (Abdelkrim & Bensettiti, 1988, Algeria), [sporophytic] 24 (Labadie, 1979, Algeria), [sporophytic] 40 (Fernandes & Queiros, 1969, Portugal).

Distribution, ecology, and phytogeography. Iberian Peninsula and northern Africa, north of Morocco and Algeria, 10–800 m, reaching 1900 m in Morocco. Esparto grass lands and heaths in well-drained carbonate soils (calcareous, dolomites, margo-calcareous soils, loams and gypsiferous loams). Bioclimatic belts: arid infra-Mediterranean, semi-arid thermo-Mediterranean, dry thermo-Mediterranean, semi-arid meso-Mediterranean, and dry meso-Mediterranean (sensu Rivas-Martínez et al., 1999).

Selected specimens examined. **EUROPE. SPAIN. Albacete:** Bonete, Cerro Chinar, *Rivera s.n.* (MAF-134116). **Alicante:** Beniardá, Penya Martí, *Solanas s.n.* (ABH-4872); Pinoso, *Camuñas s.n.* (ABH-6709); Onil, El Biscoig, *Calabuig s.n.* (ABH-7134); Villena, Cabezo de Jordán, *Alonso s.n.* (ABH-8346); Sª del Maigmó, *De la Torre s.n.* (MUB-14512); Altea, Sierra de Bernia, *Soler et al. s.n.* (ABH-138151); Benissa, *Barber s.n.* (ABH-9679); Crevillente, La Garganta, *Vicedo s.n.* (ABH-8364); Petrer, *Juan & Cristóbal s.n.* (ABH-10022); Alicante, Castillo de Santa Bárbara, *Camuñas & Crespo s.n.* (ABH-32188); Orihuela, Dehesa de Campoamor, *Espinas et al. s.n.* (ABH-17502); Monóvar, Sierra del Reclot, *Navarro et al. s.n.* (ABH-36639). **Almería:** San José, Cabo de Gata, *Codina s.n.* (ABH-11762); Fernán Pérez, Cerro Jayón, *Sanz Fábregas s.n.* (MAF-141621); Velez Rubio, *García Gea s.n.* (MUB-19507). **Balearic Islands:** Ibiza, Canal Rosari to Cala Londal, *Font Quer s.n.* (MA-5223); Ibiza, Cap Martinet, *Rivas Martínez, Costa & Regueiro s.n.* (MA-422483); Espartal island, near Ibiza, *F. Palau s.n.* (MA-158280). **Córdoba:** near Priego, *Borja s.n.* (MAF-71164); Priego, *Borja s.n.* (MAF-102574). **Guadalajara:** Loranca de Tajuña, *F. Bellot, Carballal & Ron s.n.* (MA-198084); Hontova, *F. Bellot, Carballal & Ron s.n.* (MA-198085). **Madrid:** Aranjuez, close to Ontígola pool, *Valle, Ruiz & González s.n.* (MAF-117817); Villamanrique de Tajo, *D. Belmonte s.n.* (MAF-119881); Campo Real, *D. Belmonte s.n.* (MAF 120048); Torrelaguna, A. *Galán de Mera s.n.* (MAF-120384). **Málaga:** Sierra de Yeguas, Sierra de los Caballos, *Talavera & Valdés 2054/73* (MAF). **Murcia:** Aguilas, Sierra de la Fuente del Pobre, *Fernández s.n.* (MAF-93813); El Carmolí, *Alcaraz s.n.* (MUB-3480); Sª del Molino, Calasparra, *Fdez./Fdez.-Delgado s.n.* (MUB-3915); Bco. del Pozo, Sª de Ricote, *Olmo & Hurtado s.n.* (MUB-1999); Sª del Baño, Fortuna, *Alcaraz s.n.* (MUB-7211); Sª del Cantón, Abanilla, *Alcaraz s.n.* (MUB-7789); Sierra de Abanilla, Abanilla, *Alcaraz s.n.* (MUB 7814). **Tarragona:** Pons, Ametllá de Mar, *Raynal 18820* (MAF-105008). **Toledo:** Ocaña, Arroyo del Corralejo valley, *Águila, Laorga & Sánchez-Mata s.n.* (MAF-107321); Mora, "Quemadillo," Algodor river hills, *S. Laorga s.n.* (MAF-110886). PORTUGAL. **Algarve:** Albufeira, Barrocal da Gralheira, *E. Paunero 6048* (MA); Barrocal da Gralheira, *Malato-Beliz et al. 6048* (MA); Loulé, road to Sao Brás de Alportel, road to Ribeira das Mercês, *Malato Beliz & J. A. Guerra 15318* (MA); tableland betw. Sagres & S Vicente, *Paunero 5817* (MA), *Malato-Beliz & Guerra 5817* (MA); Loulé, road to Barranco do Velho, Olho de Agua top, Cabeça Gorda, *Malato-Beliz & Guerra 15186* (MA); between Lagos &Vila do Bispo, Luz beach, *Malato-Beliz 3167* (MA); Monte Clérigo beach, *Segura Zubizarreta s.n.* (MA-957356); Monte Clérigo, *J. Vogueira 10317* (COI); Loulé road to Barranco do Velho, Olho de Agua top, Cabeça Gorda, *Malato-Beliz & Guerra 15186* (MA); hill above Cabeça Gorda of Loulé, *Malato-Beliz & Guerra 15651* (MA); Cerro da Zorra, *Malato-Beliz & Guerra 15771* (MA); Cape S Vicente, *J. F. Guimaraes s.n.* (COI); Budens, *Fernandes et al. 7348* (COI); Tavira, *J. F.*

Guimaraes s.n. (COI). **AFRICA.** ALGERIA. **Oran:** Orán, Djebel Santo plain, *O. Debeaux s.n.* (G-8473/5); Djebel Santo, *J. A. Battandier & L. Trabut s.n.* (G-8473/6), *E. Bourgeau s.n.* (G-8473/12); Mers el Kebir, *Pitard s.n.* (G-8473/24); Santa Cruz, *H. Romieux 1086* (G [2]); Arzew, *Boré s.n.* (G-8473/15 & G-8473/33); Country of Orán, *G. L. Durando 184* (G [3]); Aïn-el-Turk plain, near Orán, *B. Balansa 286* (G [3]); Tlemcen, *Havard s.n.* (G-8473/25); Pointe Canastel, 15 km E Orán, *D. A. & S. J. Sutton 280* (RNG). **Algiers:** Wilaya M'Sila, Saharian Atlas, 27 km SW Bou Saada on the road to Djelfa, *D. Podlech 37196* (G); Teniet-El-Had, *D. L. Trabut s.n.* (MA-5228); 10 km SW Djelfa, *Davis 53315* (RNG). **Constantine:** Batna, Constantine south, *Thiébault 1887* (G [2]); Aïn Beida, *Girod s.n.* (G-8473/20). MOROCCO. **Rif:** Near Xauen, *Font Quer 22* (G & MA); Ech Chaoun, *M. Gandoger s.n.* (G-8473/13); Tetuan, Djebel Dersa, *C. J. Pitard 441* (G [2]); Tetuan, Bab Taza, hill before Adeldal, way to Tarifa, *M. A. Mateos & J. M. Montserrat JMM5528/3* (RNG); Al-Hoceima, El-Yebha, *J. M. Montserrat & B. Valdés, 2953/91* (RNG); Kert Ganc, 80 km SW Nador, 4 km from Ain Zorah on the road from Saka, *A. Acchal et al. OPTIMA V/875* (RNG). **High Atlas:** 111 km N from Errachidia (Ksar-es-Souk) along road P21 to Midelt, a few km south of Tizi-n-Tairhemt, *Jury, Rejdali & F. Watson 9238* (MA & RNG). **Orient Tableland:** Oujda, Beni Snassen mountains, after Taforalt, *Etlaftski, Mateos & Valdés BV593/93* (RNG); Debdou, Oujda, *Wilckzek et al. 479* (G). TUNISIA. **Kelibia:** Between Kelibia and El-Haouaria, *Raffaelli & Ricceri s.n.* (FI).

1b. Stipa tenacissima subsp. **gabesensis** (Moraldo, Raffaelli & Ricceri) Barreña, D. Rivera, Alcaraz & Obón, comb. et stat. nov. Basionym: *Stipa gabesensis* Moraldo, Raffaelli & Ricceri, Candollea 44: 78. 1989. TYPE: [Tunisia] "Pseudosteppe aux environs de Gabès, 16 Apr. 1986." *Raffaelli & C. Ricceri s.n.* (holotype, FI 3016/1 not seen; isotype, FI).

Stipa kralifii Moraldo, Raffaelli & Ricceri, Candollea 44: 80. 1989. Syn. nov. TYPE: [Tunisia] "Route n. 13 entre Sfax et Faid, pentes du Djebel Sidi Kralif, 300–350 m, 16 Apr. 1986," *M. Raffaelli & C. Ricceri s.n.* (holotype, FI 3016/3 not seen; isotype, FI).

Sheaths glabrous or scabrous; ligule replaced by a pair of trichome tufts, 2–4 cm long on the basal leaves, 1–2 cm long on the upper leaves. Leaf blade linear, narrow, frequently strict, convolute, abaxially glabrous and adaxially pubescent, (0.4)1.3–1.5(2.4) mm wide. Inflorescence contracted, paniculate, broadly lanceolate, 30–40 cm long, not deciduous, with 10 to 25 branchlets and 30 to 60 spikelets, spatheate, spikelet-bearing axes persistent, pubescent, with 1 to 7 spikelets each. Glumes 2, ± equal, upper glume (19)23–26(30) mm, lower glume (20–)25–29(-33) mm, glabrous, entire to 2-cleft (in its upper part), with pubescent veins; lemmas lanceolate, (7.4)8.8–9.8(12.4) mm, lobes (0.8)1.6–2.2(3.0) mm; awns 10(45–)58–73(88) mm; palea (6.4)7.5–8.3(10) mm, pubescent throughout (Fig. 1c).

Chromosome number. [Gametophytic] 36, Libya, putative hexaploid (Faruqi et al., 1987).

Illustrations. Figures 2, 4 in Raffaelli and Ricceri (1989: 79, 82).

Distribution, ecology, and phytogeography. Central Tunisia, eastern Algeria from the Ouled-Djellal zone, and western Libya from Tripolitania, 450–710 m (Fig. 2). One sheet (*Martin & Paunero s.n.* (MA-29162)) containing plants from Benisicar, Morocco, shows characteristics similar to this subspecies. Esparto grass lands and scrubs on carbonate soils. Bioclimatic belt: thermo-Mediterranean semiarid (Rivas-Martínez et al., 1999).

Stipa kralifii is referred to *S. gabesensis* for the first time. However, both were referred to *Stipa tenacissima* by Vázquez and Devesa (1996).

Selected specimens examined. **AFRICA.** ALGERIA. **Constantine:** Zab mtns., near Ouled-Djellal crossroads, *Robledo & Sanchez s.n.* (MUB-18953); El Kantara, *Chevallier* (FI). LIBYA. **Tripoli:** Djebel Nafusah, 17 km from Jadu to Efrén, *Davis 49705* (RNG); 23 km W Khoms, Djebel Nafusah, *Davis 49797* (RNG); Sine loc., *Onofry s.n.*, (RO); Jadu [Tripoli district], *E. Carano & G. Lusina s.n.* (RO [2]); Kasr Daun, *Pampanini, 2348* (FI); Tarhuna, Uadi Msaaba, *Pampanini 1408* (FI); Plateau betw. Misda & Gharian, *Bargagli-Petruci s.n.* (FI); Gharian, Uadi Gharian, *Pampanini 3908* (FI); Ras Bu Taulil, *Pampanini 1310* (FI); Abiar Milgah in Ras Ter, *Pampanini 1138* (FI); Abiar Milgah in Ras Neb, *Pampanini 475* (FI); Mesellata, *Pampanini 3152* (FI); Nalut tableland, *Comtesse O. Bargagli-Petrucci s.n.* (FI); between Nalut and Sinauen, *Comtesse O. Bargagli-Petrucci s.n.* (FI). MOROCCO. **Rif:** Benisicar, *Martin & Paunero s.n.* (MA-29162). TUNISIA. **Kairouan:** Bou–Kournim, *Cuénod s.n.* (G-8473/14), *Cuénod s.n.* (G-8473/14); 22 km S of Kasserina, *Kennedy s.n.* (RNG). **Gabes:** Djebel-Gafsa, *Pitard 5227* (MA); near 52 km NW Gafsa tow. Feriana, *Davis & Lamond D57343* (RNG); road Metameur–Matmata, *Raffaelli & Ricceri s.n.* (FI).

2. Stipa antiatlantica Barreña, D. Rivera, Alcaraz & Obón, sp. nov. TYPE: [Morocco] "Agadir, Tizi Mlil, near Tafraoute (Anti Atlas) 29 43'N, 8°51'W, unploughed grounds on volcanic substrata, 1800 m, 5 Jun. 1980," *A. Charpin, J. Fernández-Casas, F. Jacquemoud & D. Jeanmonod MAR-275* (holotype, G 179625; isotype, MA-292529).

Stipa tenacissima var. *villosiuscula* Lindberg, Itin. Mediterr.: 24. 1932. TYPE: [Morocco] "Atlas major in monte Djebel Amsitten, in rupe in valle supra Tis Rarin. In convalle fluminis Imminem, in declivibus saxosis montis Djebel Tihalatine, c. 1500 m," *H. Lindberg* (holotype, H not seen).

Paleis numquam glabris atque dense pubescentibus et vaginis foliorum apice pubescenti a *Stipa tenacissima* subspecie *gabesensi* et typica differt.

Leaf sheaths pubescent, especially in the upper third (Fig. 1a); ligule replaced by a pair of trichome tufts, 2–4 cm long on the basal leaves, up to 1 cm long on the upper leaves. Leaf blade linear, narrow, convolute, abaxially glabrous and adaxially pubescent, 1.1–1.5(1.7) mm wide. Inflorescence contracted, paniculate, broadly lanceolate, 30–40 cm long, not deciduous, with 10 to 30 branchlets and 30 to 80 spikelets, spatheate, spikelet-bearing axes persistent, pubescent, with 1 to 7 spikelets each. Glumes 2, ± equal; upper glume (21)22–26(30) mm and lower glume (23)25–29(32) mm, glabrous, entire, with pubescent veins, lemmas, (8)8.7–9.2(10.0) mm, lobes (1)1.8–2.4(2.9) mm, awns 10(47)55–59(61) cm, palea (7.5)8.2–9.0(9.5) mm, pubescent throughout (Fig. 1b).

Chromosome number. [Sporophytic] [= 6x?] = 66, putative hexaploid, Morocco (Lungeanu, 1980).

Distribution, ecology, and phytogeography. Africa, from southern Morocco, the province of Agadir (Fig. 2); 1250–1800 m; from esparto grass lands and scrubs in calcareous soils. Bioclimatic belts: thermo-Mediterranean semiarid (Rivas-Martínez et al., 1999), within the *Acacion gummiferae* Barbero, Quézel & Rivas-Martínez group of plant communities, especially *Polygalo balansae–Arganietum spinosae* Barbero, Benabid, Quézel, Rivas-Martínez & Santos (Barbero et al., 1982). Maquis shrubland of *Tetraclinis articulata* (Vahl) Masters and *Cistus* spp. on sandy soil.

Neither of the two specimens cited by Harald Lindberg in the protologue of *Stipa tenacissima* var. *villosiuscula* Lindberg could be found in the Herbarium, Botanical Museum, University of Helsinki (H). In fact, there seems to be no material labeled as *S. tenacissima* var. *villosiuscula* in H. Moreover, *S. tenacissima* var. *villosiuscula* is not included in the catalogue of type specimens in H, and there is no reference to the specimens mentioned above. Strangely, these two specimens seem to be the only Lindberg specimens of *Stipa* that are missing in the H collections. The other 24 collections mentioned on the same page (Lindberg, 1932: 24) with *S. tenacissima* var. *villosiuscula*, for *S. arenaria* Brotero, *S. aristella* L., *S. barbata* Desfontaines, *S. gigantea* Lagasca, *S. lagascae* Roemer & Schultes, *S. nitens* Ball, *S. parviflora* Desfontaines, *S. tenacissima* L., and *S. tortilis* L., were all located by J. Nurmi (pers. comm.).

Selected specimens examined. **AFRICA. MOROCCO. Anti-Atlas:** Tizi Mlil near Trafaoute (Anti-Atlas), *Charpin, Fdez. Casas, Jacquemoud & Jeanmonod MAR 275* (G, MA). **High Atlas:** High Atlas, 20 km NE on road P 32 near Tizi-n-Test, *Podlech 12788* (G). **Essaoiura:** above Essaouira [Mogador], *P. & J. Davis s.n.* (BM 756976).

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Literature Cited

Abdelkrim, H. & F. Bensettiti. 1988. Contribution à la connaissance autoécologique, caryologique, syntaxonomique de l'alfa (*Stipa tenacissima* L.). Ann. Inst. Natl. Agroc. (El Harrach) 12(1): 105–118.

Barbero, M., A. Benabid, P. Quézel, S. Rivas-Martínez & A. Santos. 1982. Contribution à l'étude des Acacio-Arganietalia du Maroc sud-occidental. Doc. Phytosoc. 6: 311–338.

Bor, N. L. 1985. Gramineae. Pp. 1711–1872 *in* R. D. Meikle (editor), Flora of Cyprus, Vol. 2. Bentham-Moxon Trust (Royal Botanic Gardens), Kew.

Caro, J. A. & E. Sanchez. 1973. Las especies de *Stipa* (Gramineae) del subgénero Jarava. Kurtziana 7: 61–116.

De Winter, B. 1965. The South African Stipeae and Aristideae (Gramineae). An anatomical, cytological and taxonomic study. Bothalia 8: 201–404.

Desfontaines, R. L. 1798. Flora Atlantica, Vol. I. L. G. Desgranges, Paris.

Devesa, J. A., T. Ruiz, M. C. Viera, R. Tormo, F. Vázquez, J. P. Carrasco, A. Ortega & J. Pastor. 1991. Contribución al conocimiento de las Poáceas en Extremadura (España)—III. Bol. Soc. Brot., Ser. 2 64: 35–74.

Faruqi, S. A., H. B. Quraish & M. Inamuddin. 1987. Studies in Libyan grasses X. Chromosome number and some interesting features. Ann. Bot. 45: 75–102.

Fernandes, A. & M. Queiros. 1969. Contribution à la connaisance cytotaxonomique des Spermaphytes du Portugal. I. Gramineae. Bull. Soc. Bot., Série 2 43: 3–140.

Fowler, H. W., F. G. Fowler & R. E. Allen. 1990. The Concise Oxford Dictionary of Current English. Clarendon Press, Oxford.

Freitag, H. 1985. The Genus *Stipa* (Gramineae) in Southwest and South Asia. Notes Roy. Bot. Gard. Edinburgh 42: 355–489.

Gaffiot, F. 1984. Dictionnaire Latin Français. Hachette, Paris.

Hilu, K. H. 2004. Phylogenetics and chromosomal evolution in Poaceae (grasses). Austral. J. Bot. 52: 13–22.

Hitchcock, A. S. 1925. The North American species of *Stipa* and synopsis of South American species of *Stipa*. Contr. U.S. Natl. Herb. 24: 215–289.

Kozuharov, S. I. & A. V. Petrova. 1991. Chromosome numbers of Bulgarian angiosperms. Fitologiya 39: 72–77.

Kunth, C. S. 1829. Révision des Graminées publiées dans les Nova Genera et Species Plantarum de Humboldt et Bonpland. Gide Fils, Paris.

Labadie, J. 1979. Etude caryosystématique de la flore de l'Algérie. Naturalia Monspel. Bot. 32: 1–11.

Le Houérou, H.-N. 1959a. Recherches Écologiques et Floristiques sur la Végétation de la Tunisie Méridionale. Première partie: Les Milieux Naturels, la Végétation. Institut de Recherches Sahariennes. Université d'Alger, Algiers.

———. 1959b. Recherches Ecologiques et Floristiques sur la Végétation de la Tunisie Méridionale. Seconde partie: La Flore. Institut de Recherches Sahariennes. Université d'Alger, Algiers.

Liddell, H. G. & R. Scott. 1996. Greek–English Lexicon. With a Supplement. Clarendon Press, Oxford.

Lindberg, H. 1932. Itinera Mediterranea. Acta Soc. Sci. Fenn., Ser. B, Opera Biol. 1(2): 1–178.

Lungeanu, I. 1980. *Stipa tenacissima*. *In:* Á. Löve (editor), Chromosome number reports 66. Taxon 29: 164.

Maire, R. 1953. Flore de l'Afrique du Nord, Vol. II. Lechevalier, Paris.

Moraldo, B. 1986. Il genere *Stipa* L. (Gramineae) in Italia. Webbia 40(2): 203–278.

Pereira, A. X. 1974. Flora de Portugal. J. Cramer & H. K. Swan, Leutershausen.

Pfeiffer, L. K. 1873–1874. Nomenclator Botanicus, Vols. 1 & 2. Theodor Fisher, Kassel.

Podani, J. 1994. Multivariate data analysis in ecology and systematics: A methodological guide to the SYN-TAX 5.0 package. Ecological Computations Series (ECS), Vol. 6. The Hague.

Rackham, H. 1971. Pliny, Natural History, Books 17–19, Vol. V. Harvard Univ. Press, Cambridge.

Raffaelli, M. & C. Ricceri. 1989. Contribution à la connaissance de la flore de la Tunisie du Centre-Nord. Candollea 44: 75–102.

Reeder, J. R. 1984. Chromosome number reports LXXXII. Taxon 33: 126–134.

Renvoize, S. A. 1985. A survey of leaf-blade anatomy in grasses. VI. Stipeae. Kew Bull. 40: 731–736.

Rivas-Martínez, S., D. Sánchez & M. Costa. 1999. North American boreal and western temperate forest vegetation. Itinera Geobot. 12: 5–316.

Rivera, D. & C. Obón. 1991. La Guía de Incafo de las Plantas Útiles y Venenosas de la Península Ibérica y Baleares. Incafo, Madrid.

Roberts, M. & D. Etherington. 1994. Bookbinding and the Conservation of Books. A Dictionary of Descriptive Terminology. <http://palimpsest.stanford.edu/don/don.html>. Accessed January, 2006. [Version from the 1982 edition by W. Henry, Stanford University.]

Scholz, H. 1985. *Stipa*. *In:* P. H. Davis (editor), Flora of Turkey and the East Aegean Islands, Vol. 9. Edinburgh Univ. Press, Edinburgh.

Stepanov, N. V. 1994. Chromosome numbers of some higher plant taxa of the flora of Krasnoyarsk region. Bot. Zurnal 79(2): 135–139.

Steudel, E. G. 1854. Synopsis Plantarum Glumaceārum 1(2): 132, J. B. Metzler, Stuttgart.

Strid, A. & I. A. Andersson. 1985. Chromosme numbers of Greek mountain plants. Bot. Jahrb. Syst. 107: 203–228.

Tovar, O. 1993. Las Gramineas (Poaceae) del Peru. Ruizia 13: 1–480.

Vázquez, F. M. & J. A. Devesa. 1996. Revisión del género *Stipa* L. y *Nassella* Desv. (Poaceae) en la Península Ibérica e Islas Baleares. Acta Bot. Malac. 21: 125–189.

———, G. López González & J. A. Devesa. 1995. Tipificación de los táxones linneanos del género *Stipa* (Gramineae) que viven en la Península Ibérica. Anales Jard. Bot. Madrid 52(2): 179–186.

Walter, H. 1977. Zonas de Vegetación y Clima. Omega, Barcelona.

Watson, L. & M. J. Dallwitz. 2003. Grass Genera of the World: Descriptions, Illustrations, Identification, and Information Retrieval; including Synonyms, Morphology, Anatomy, Physiology, Phytochemistry, Cytology, Classification, Pathogens, World and Local Distribution, and References. <http://delta-intkey.com/grass/www/stipa-sl.htm>. [Accessed 10 August 2003.]

Zeven, A. C. & J. M. J. de Wet. 1982. Dictionary of Cultivated Plants and Their Regions of Diversity, 2nd ed. Centre for Agricultural Publications and Documentation, Wageningen.

Appendix 1

List of Species

1. *Stipa tenacissima* Loefling ex L.
   1a. Stipa tenacissima L. subsp. tenacissima
   1b. Stipa tenacissima L. subsp. gabesensis (Moraldo, Raffaelli & Ricceri) Barreña, D. Rivera, Alcaraz & Obón.
2. *Stipa antiatlantica* Barreña, D. Rivera, Alcaraz & Obón

Appendix 2

Index to Exsiccatae

Specimens examined are listed alphabetically by collector, followed by collection numbers and herbarium (herbarium numbers are given for specimens with no collection numbers). The species number corresponds to its number in the List of Species.

Acchal et al. (RNG) (1a); *Águila, Laorga & Sánchez-Mata* (MAF) (1a); *Alcaraz* (MUB-6946, MUB-6947, MUB-7214, MUB-7789, MUB-7844, MUB-7846, MUB-30511a, MUB-3480, MUB-6939) (1a); *Alonso* (ABH-8346) (1a); *Anonymous* (MUB-11449) (1a).

Balansa (G-8473/17, G-8473/34, G-8473/36) (1a); *Barber* (ABH-9679) (1a); *Bargagli-Petrucci* (FI) (1b); *Battandier & Trabut* (G-8473/6) (1a); *Belmonte* (MAF-119881, MAF-120048) (1a); *Bellot, Carvallal & Ron* (MA-198084, MA-198085) (1a); *Borja* (MAF-102574, MAF-71164) (1a); *Bourgeau* (G-8473/12) (1a); *Boré* (G-8473/15, G-8473/33) (1a).

Calabuig (ABH-7134) (1a); *Campos* (MUB-2945); *Camuñas & Crespo* (ABH-32188) (1a); *Camuñas* (ABH-6709) (1a); *Carano & Lusina* (RO-2) (1b); *Codina* (ABH-11762) (1a); *Cuénod* (G-8473/14) (1b), (G) (1b); *Charpin, Fdez. Casas, Jacquemoud & Jeanmonod* (G-179625, MA-292529) (2); *Chevallier* (FI) (1b).

Davis D49705 (RNG) (1b); *Davis D49797* (RNG) (1b); *Davis & Davis* (BM 756976) (2); *Davis & Lamond D57343* (RNG) (1b); *De la Torre* (MUB-14512) (1a); *Debeaux* (G-8473/5) (1a); *Durando* (G-8473/16, G-8473/27, G-8473/35) (1a).

Espinar et al. (ABH-17502) (1a); *Etlaftski, Mateos & Valdés BV593/93* (RNG) (1a).

Fdez./Fdez.-Delgado (MUB-3915); *Fernández* (MAF-93813) (1a); *Font Quer* (G-8473/10, MA-5223, MA-5230) (1a).

Galán de Mera (MAF 120384); *Gandoger* (G-8473/13, G-8473/40, G-8473/41) (1a); *García Gea* (MUB-19507) (1a); *Girod* (G-8473/20) (1a); *Guirao* (MUB-3053) (1a).

Havard (G-8473/25) (1a).

Izco (MAF-73689) (1a).

Jimenez (MUB-39557) (1a); *Juan & Cristóbal* (ABH-10022) (1a); *Jury, Rejdali & Watson 9238* (MA, RNG) (1a).

Kennedy (RNG) (1b).

Laorga (MAF-110886) (1a).

Malato Beliz (MA-291076, MA-184180) (1a); *Malato-Beliz & Guerra* (MA-232782, MA-291079, MA-291081, MA-291082) (1a); *Malato-Beliz et al.* (MA-291077) (1a); *Malato-Beliz & J. A. Guerra* (MA-291080) (1a); *Martin & Pannero* (MA-29162) (1b); *Mateos & Montserrat JMM5528/3* (RNG) (1a); *Miñarro & Periago* (MUB-4442) (1a); *Montserrat & Valdés, 2953/94* (RNG) (1a).

Navarro & Sánchez Mata, 78 (MAF-111415) (1a); *Navarro, Navarro & Mondejar* (ABH-36639) (1a).

Olmo (MUB-13636) (1a); *Olmo & Hurtado* (MUB-1999); *Onofry* (RO) (1b).

Palau (MA-158280) (1a); *Pampanini 1138* (FI); *Pampanini 1340* (FI) (1b); *Pampanini 2055* (FI) (1b); *Pampanini 2055* (FI) (1b); *Pampanini 2575* (FI) (1b); *Pampanini 2676* (FI) (1b); *Pampanini 3268* (FI) (1b); *Pampanini 3410* (FI) (1b); *Pampanini 3617* (FI) (1b); *Pampanini 575* (FI) (1b); *Pampanini 2348* (FI) (1b); *Pampanini 475* (FI) (1b); *Pau* (MA-5229) (1a); *Paunero* (MA-187951, MA-187950) (1a); *Pineda, Salinas & Ruiz* (MUB-36261) (1a); *Pitard* (G-8473/21, G-8473/26, G-8473/24) (1a); *Pitard* (MA) (1b); *Podlech* (G-284110) (1a); *Podlech* (G-360086) (2).

Raffaelli & Ricceri (FI) (1a); *Raffaelli & Ricceri* (FI) (1b); *Raynal 18820* (MAF-105008); *Rivas Martínez, Costa & Regueiro* (MA-122483) (1a); *Rivera* (MAF-134116) (1a); *Robledo & Sanchez* (MUB) (1b); *Robledo* (MUB-13838) (1a); *Rodriguez* (MUB-12110) (1a); *Romieux* (G-8473/19) (1a).

Sánchez-Mata & Navarro (MAF-134954) (1a); *Sanz Fábregas* (MAF-141621) (1a); *Segura Zubizarreta* (MA-957356) (1a); *Selma* (MUB-19255) (1a); *Solanas* (ABH-1872) (1a); *Soler & Soler* (ABH-16759) (1a); *Soler, Martínez & Soler* (ABH-15851) (1a); *D. A. & S. J. Sutton 280* (RNG) (1a).

Talavera & Valdés (MAF-125100) (1a); *Thiébault* (G-8473/8, G-8473/29) (1a); *Trabut* (MA-5228) (1a).

Valle, Ruiz & González (MAF-117817) (1a); *Vicedo* (ABH-8364) (1a).

A New Species of *Cyrtopodium* (Orchidaceae) from the Cerrado of Central Brazil

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Abstract. *Cyrtopodium macedoi*, a new species (Orchidaceae, Cymbidieae, Cyrtopodiinae) from the cerrado vegetation of central Brazil, is described and illustrated. The species was first collected in 1951 but was subsequently misidentified as *C. vernum*. The principal distinctive character for *C. macedoi* is the basal portion of the corolla lip and the region between the lateral lobes, which is strongly deflexed and almost parallel to the lip midlobe. *Cyrtopodium macedoi* appears to be rare and so far known only from two sites in the Triângulo Mineiro region of the western part of the state of Minas Gerais in southeastern Brazil.

Resumo. *Cyrtopodium macedoi*, uma nova espécie (Orchidaceae, Cymbidieae, Cyrtopodiinae) do Cerrado do Brasil central, é descrito e ilustrado. A espécie foi coletada pela primeira vez em 1951, mas identificada erroneamente como *C. vernum*. A principal característica distintiva da espécie é a base e a região da corola entre os lobos laterais do labelo fortemente deflexa, quase paralela ao lobo mediano. A espécie parece ser rara e até o momento, conhecida de apenas duas localidades na região do Triângulo Mineiro, no oeste estado de Minas Gerais, no sudeste do Brasil.

Key words: Brazil, cerrado, Cymbidieae, Cyrtopodiinae, *Cyrtopodium*, Orchidaceae.

Cyrtopodium R. Brown, a Neotropical genus that ranges from southern Florida to northern Argentina, contains about 45 species, 36 of which occur in Brazil. The center of diversity of the genus is the Brazilian cerrado vegetation, where about 28 species occur. The cerrado is a species-rich savanna vegetation covering 2 million km^2 of central Brazil (Ratter et al., 1997). A particularly *Cyrtopodium*-rich area is the "Distrito Federal" or Federal District, located in the cerrado core region, where 18 taxa are known (Batista & Bianchetti, 2003).

Cyrtopodium includes primarily terrestrial and a few epiphytic and lithophytic species and occupies a broad range of habitats, including open grasslands, typical cerrado (savanna-like) vegetation, dry rocky slopes, and humid to permanently wet areas. Despite the showy flowers of many species, most of the species are unknown to horticulturists and are rarely seen in cultivation. This situation has somewhat changed in recent decades with the increasing human occupation of the cerrado, which has made access to these plants easier. As a consequence, interest in the cultivation of this genus among hobbyists has grown in recent years, at least locally in central Brazil.

The main taxonomic references for *Cyrtopodium* are those of Cogniaux (1898–1902) in *Flora Brasiliensis* and Hoehne (1942) in *Flora Brasilica*. Warming (1884) and, more recently, Menezes (2000) have provided color illustrations and observations about the habitat and ecological preferences of the species.

During the examination of dried specimens of *Cyrtopodium* in most Brazilian herbaria (ALCB, BHCB, BOTU, CEN, CESJ, CPAP, CVRD, EAC, EAN, ESA, HB, HBR, HEPH, HRCB, HUEFS, HUFU, IBGE, ICN, MBM, OUPR, PACA, R, RB, SP, SPF, UEC, UFG, UB, UPCB) as part of an ongoing revision of the genus by the authors, we encountered a taxon represented by a single collection from southeastern Brazil that we were unable to assign to any known species in the genus. The resampling and examination of living specimens from the same site, 52 years after the original collection, have now shown that this taxon belongs to a new species described here as *C. macedoi*.

Cyrtopodium macedoi J. A. N. Batista & Bianchetti, sp. nov. TYPE: Brazil. Minas Gerais: Mun. Ituiutaba, flowered in cultivation in Brasília from Sep. to early Oct. 2003, *J. A. N. Batista & L. B. Bianchetti 1306* (holotype, CEN; isotypes, K, MO, RB, SP). Figures 1, 2.

Cyrtopodium macedoi partibus vegetativis *C. caiapoensi* L. C. Menezes simile, morphologia florali *C. poecilo* Reichenbach f. & Warming simile et florum colore *C. pallido* Reichenbach f. & Warming simile, sed a his et ab omnibus speciebus generis basi labelli et parte intra lobos laterales fortiter deflexa, fere parallele ad basim lobi centralis disposita et calo erecto, integro, paulo vel non verrucoso, omnino disposito in basi lobi centralis labeli differt.

Terrestrial herb; *pseudobulbs* completely buried to partially exposed, small, oblong, apex acute, leafless from the second year onward, externally whitened, 6–11 × 0.8–2.3 cm; *roots* numerous, 3.5–4 mm wide, glabrous. *Leaves* at flowering 6 to 9, partially to well developed, (13)20–41 × (0.5)0.7–1(1.4) cm, base with 4 or 5 sheaths, when fully developed 9 to 12, erect, coriaceous, linear to linear-lanceolate, the more developed 37–68 × 1–1.9 cm, articulate, the articulation 2.5–4 cm from the apex of the pseudobulb, apex acuminate. *Inflorescence* lateral, erect, simple to branched, 24–37 cm long, ca. 0.5 cm diam., green; peduncle 11–22 cm, with 2 sheath-like bracts, adpressed, 1.7–3.6 × 1–1.3 cm, straw colored; rachis 12–14 cm long; lateral branches none to 2, short, 1–5.5 cm long; floral bracts well developed, broadly lanceolate, deflexed, ca. same size or a little longer than the pedicellate ovary, 19–28 × 9–12 mm, apex acute, margins slightly undulate, green with brownish-purple spots; ovary with pedicel 16–23 mm long, perpendicular to the rachis, green to greenish-brown. *Flowers* ca. 15, slightly sweet-scented; sepals and petals outspread, concave, margins smooth, toward the apex undulate, apex minutely apiculate, green with brown or brownish-purple spots; sepals broadly lanceolate to broadly elliptical; dorsal sepal 14–27 × 9–11.5 mm; lateral sepals slightly oblique, 14–26 × 9–11 mm; petals obovate to almost orbicular, base cuneate, apex obtuse to rotundate, 10–19 × 9–10 mm; lip 3-lobed, 9.5–12 mm long, when spread 14–19 mm wide between the apex of the side lobes; base shortly unguiculate, ca. 2 mm long, white; base and region between the lateral lobes strongly deflexed, almost parallel to the central lobe base; lateral lobes erect, inner surface bent ca. 45 frontward toward the apex, obovate-oblong, falcate to linear falcate, 6–8 × 2.5–5 mm, apex rounded, base slightly to evidently constricted, margins entire, smooth, pinkish; callus entire, little to no verrucosities, then smooth, protruding, erect, completely placed at the base of the midlobe, not expanded between the lateral lobes, upper surface slightly sulcate, whitened; isthmus separating the lateral lobes from the midlobe evident; midlobe with a 1–3 mm long base, somewhat reniform to transversely elliptic, 6–8 × 9–12 mm, base constricted, apex retuse when flattened, lateral margins revolute, smooth, whitened with a few pink dots at the center and a broad pinkish strip at the margin; column erect, arcuate, trigonous, 6–8 mm long, 3.5–4 mm wide at apex, apiculate, base whitened, at middle white-lilac and toward the apex green to greenish-purple; column foot 4–5 mm long; anther 2.5–3 × 1.5–1.8 mm, yellow, apex green; pollinia two, waxy, sulcate, each ca. 1 mm long and 0.9 mm wide, yellow; stipe triangular, hyaline, ca. 1.3 mm wide at base. *Fruit* not examined.

Etymology. The new species is named in honor of Amaro Macedo, who first collected the species in 1951 and whose intensive collecting in the Triângulo Mineiro region has contributed greatly to our knowledge of the flora of this region.

Distribution. Cyrtopodium macedoi is so far known only from two sites in the municipality of Ituiutaba, in the Triângulo Mineiro region in the western part of the state of Minas Gerais in southeastern Brazil. Little is left of the original native vegetation in the area. However, because of the existence of other regions with a similar vegetation and climate in the cerrado biome of central Brazil, this species should also be expected at other localities, most probably in the cerrado core region. According to the current knowledge of the species and using the World Conservation Union Red List Categories and Criteria (IUCN, 2001), *C. macedoi* can tentatively be classified as endangered.

Habitat, ecology, and phenology. Cyrtopodium macedoi appears to be typical of dry habitats and was found growing in dry campo limpo (grassy field) and campo sujo (dry grass-herb-subshrub field) vegetation. Plants were found growing on deep clay latosols and in shallow, rocky soil on hillsides. In the former case, the plants were vegetatively more developed and had pseudobulbs that were completely buried, while in the latter case, the plants were smaller and had the pseudobulbs partially to sometimes almost completely exposed. *Cyrtopodium poecilum* Reichenbach f. & Warming, *C. cristatum* Lindley, *C. brandonianum* Barbosa Rodrigues, and *C. caiapoense* L. C. Menezes are sympatric species found in similar habitats. Like most *Cyrtopodium* species in central Brazil, *C. macedoi* flowers during the beginning of the rainy season in October, but probably also extends into late September and early November. As with other terrestrial species of the genus, flowering in *C. macedoi* is greatly enhanced by fire (Oliveira et al., 1996). In 2002 and 2003, not a single flowering plant was found during field excursions to the two sites where the species is known to occur. However, plants collected from the same sites in 2002 and kept under cultivation flowered profusely when submitted to a controlled fire in 2003 (five out of seven plants flowered after they were burned). In the label from the collection *Macedo 3385*, there is no mention of fire, but the ends of the leaves are dry and partially missing, suggesting that they may have been affected by fire at an early stage of development.

Cyrtopodium macedoi was first collected by Amaro Macedo in 1951, and it was through this single collection that we became aware of the existence of this species. The first excursion to the original site of

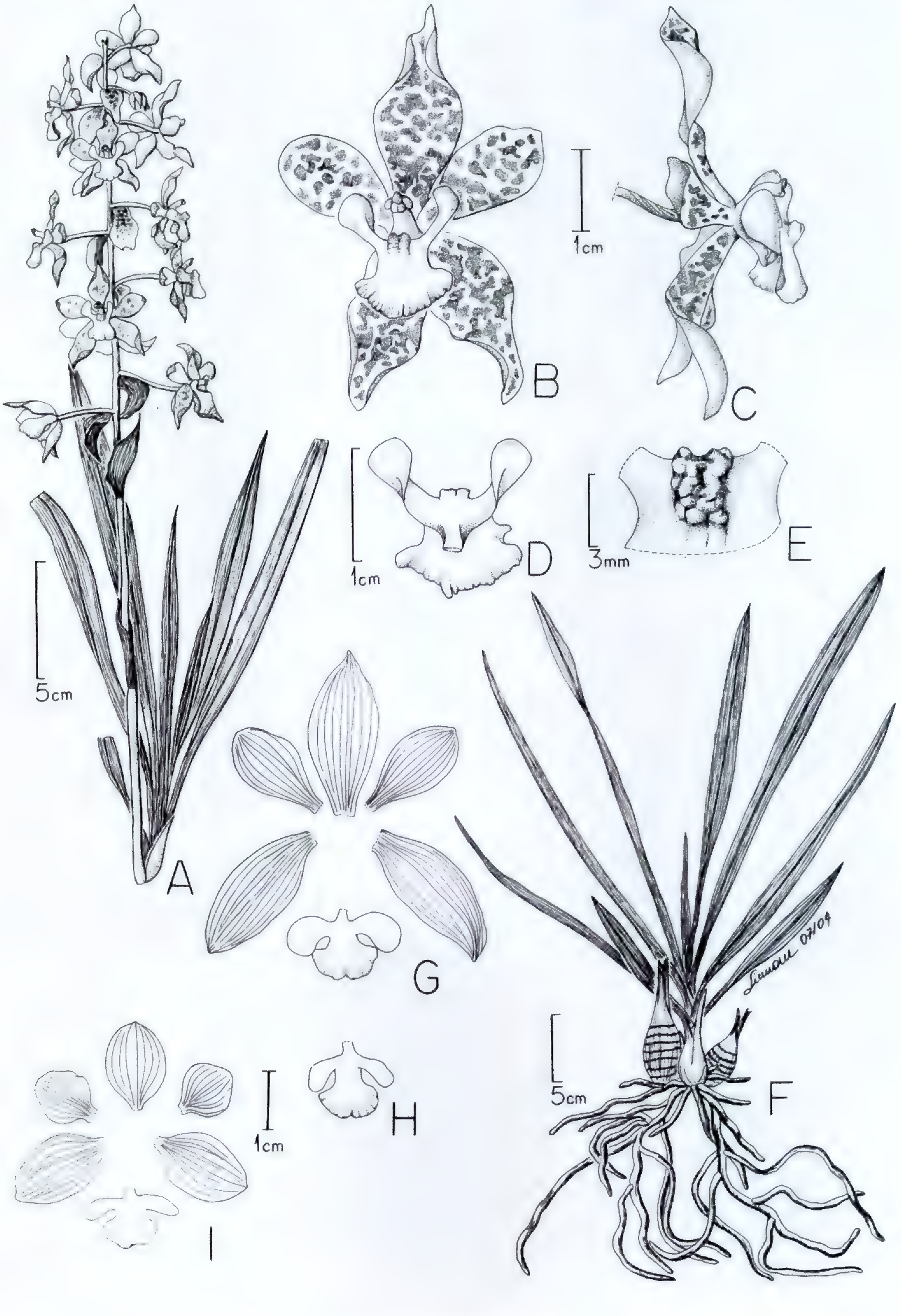

Figure 1. *Cyrtopodium macedoi* J. A. N. Batista & Bianchetti. —A. Inflorescence and leaves at anthesis. —B. Flower, front view. —C. Flower, side view. —D. Lip, back view. —E. Callus. —F. Habit, about 1 to 2 months after the flowering period. —G. Perianth. —H. Variation in lip morphology. —I. Variation in perianth. Drawn from the type collection, *Batista & Bianchetti 1306*, except H and I (*Macedo 3385*) by Simone C. Souza e Silva.

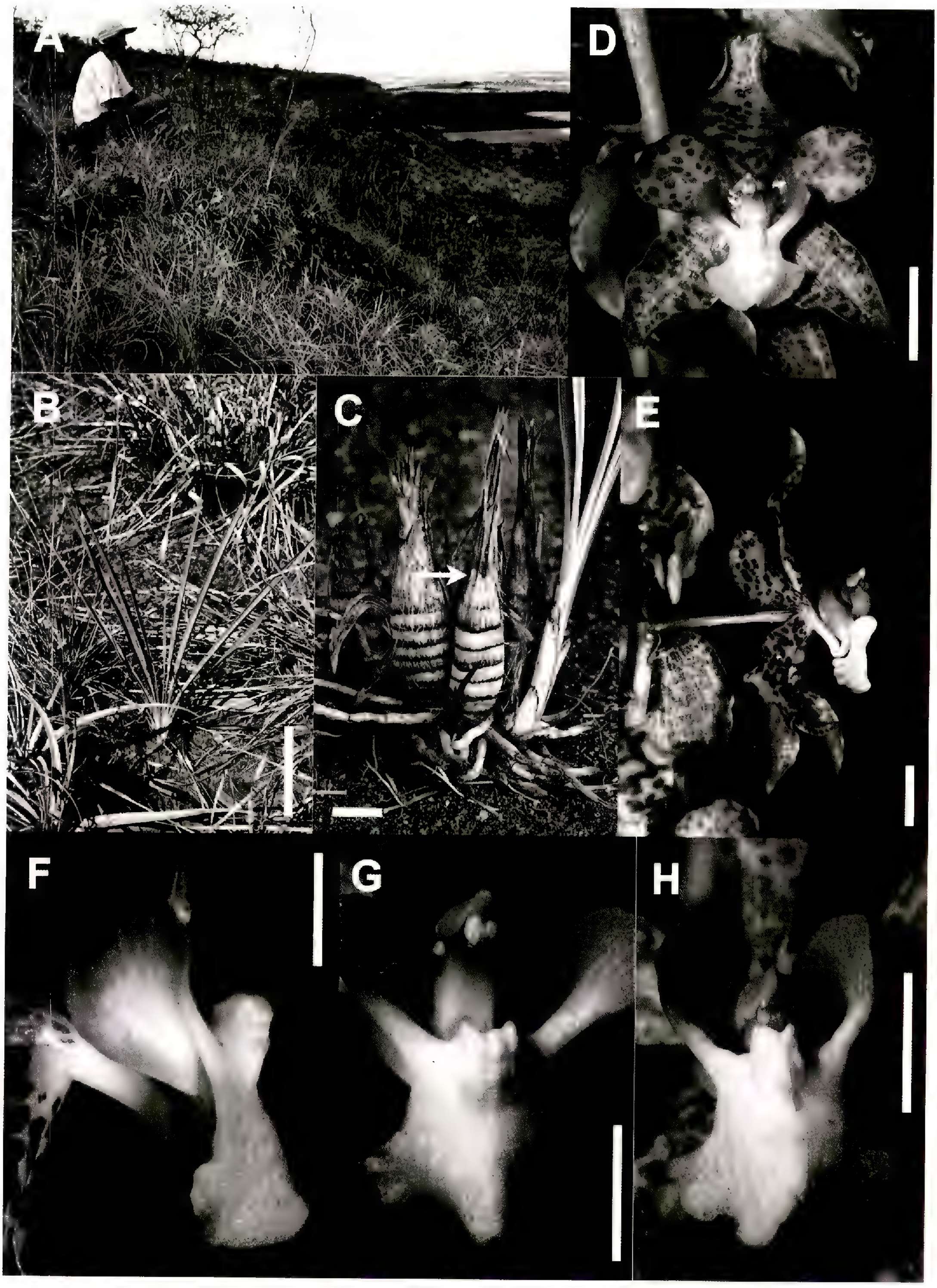

Figure 2. *Cyrtopodium macedoi* J. A. N. Batista & Bianchetti. —A. Habitat. Rocky slopes with dry campo limpo, and adjacent campo sujo; unburned site at the type locality photographed at the beginning of the rainy season. —B. Habit, nonflowering plant in its habitat about the time of flowering, in late October. —C. Pseudobulbs, from an uprooted plant. The arrow indicates the approximate position the pseudobulbs were buried. —D. Flower, front view. —E. Flower, side view. —F. Lip, side view. Note the strongly deflexed base of the lip. —G. Lip and column, front view. —H. Lip and column in old flower, front view. Note that the anther touches and rests over the callus. Scale bars = 10 cm (B), 2 cm (C), 1 cm (D, E), and 5 mm (F–H). Photographed from living specimens of the type collection (*Batista & Bianchetti 1306*).

collection revealed several plants, but none in flower. Only after some specimens kept under cultivation at Embrapa Recursos Genéticos e Biotecnologia in Brasília had flowered and after a detailed examination of the fresh flowers was it possible to positively recognize this taxon as a new species. The collection made by Amaro Macedo (*Macedo 3385*) was examined by the late orchidologist F. C. Hoehne, who mistakenly identified the species as *C. vernum* Reichenbach f. & Warming. Marcela I. Sánchez, who examined a duplicate of the Amaro Macedo collection located at the United States National Herbarium (US), identified it as *C. vernum* var. *ligulatum*. However, as far as we could determine, this variety was never published. Furthermore, *C. macedoi* is certainly not a variety of *C. vernum* and even if it was, according to the *International Code of Botanical Nomenclature* (Greuter et al., 2000), in no case does a name have priority outside the rank in which it was published (Art. 11.2).

A very distinctive character of *Cyrtopodium macedoi* that is not found in any other species in the genus is the base and the part between the lateral lobes of the corolla lip, which is strongly deflexed and almost parallel to the lip midlobe. Also, the callus of *C. macedoi* is uncommon in the genus because it shows little or no verrucosities, is protruding, and is completely placed at the base of the lip midlobe, whereas in most other species it is usually strongly verrucose, spread between the lateral lobes, and frequently reaches the claw.

Compared to other species in the genus, *Cyrtopodium macedoi* is similar to and can be easily confused in vegetative characters to *C. caiapoense*. However, *C. caiapoense* has brownish sepals and petals with strongly undulated margins, a shorter and less evident isthmus separating the lip lateral lobes from the midlobe, and non-falcate lateral lobes of the corolla lip. In flower morphology and color, *C. macedoi* is similar to *C. poecilum*, particularly to *C. poecilum* var. *roseum* J. A. N. Batista & Bianchetti, which has a pink lip. However, *C. poecilum* has externally reddish-purple pseudobulbs, fewer (5 or 6(7)) and broader (0.8–5.5 cm) leaves, parallel lateral lobes of the lip, and a larger callus that is deeply sulcate and extends until the base of the lip. *Cyrtopodium macedoi* is also similar in the morphology and color of the flowers to *C. fowliei* L. C. Menezes, but the latter species is from seasonally humid places (from southeastern Brazil to Venezuela), has smaller pseudobulbs (3–5 × 1–2.5 cm) that are externally reddish-purple, has fewer (4 to 6) leaves, and has shorter (4–5(6) × (4)5–6(7) mm), parallel, and non-falcate lateral lobes of the lip. In the general color of the flowers, *C. macedoi* is similar to *C. pallidum* Reichenbach f. & Warming, but the latter species is typically from dark, sandy-clay soil found in wetter areas and has smaller pseudobulbs (2.5–3.5 × 0.8–1 cm), fewer (4 to 6) leaves, an invariably simple inflorescence, and smaller flowers (sepals (8)10–11(13) × 6–8(11) mm). Finally, *C. vernum*, with which *C. macedoi* was previously confused, has larger (7–18 × 1.5–4 cm) and typically exposed pseudobulbs, a more branched inflorescence with (0)2 to 3(4) lateral branches (5)8.5–20(22) cm long, flowers that are yellow with red dots at the margins of the petals and sepals, and oblong, non-falcate lateral lobes of the lip.

In older flowers of *Cyrtopodium macedoi*, the column bends down or the lip moves up so that the pollinarium at the column apex touches and rests over the callus, fitting exactly into the depression in the center of the callus (Fig. 2H). In 24 years of collecting and examining hundreds of living specimens and flowers of several species, we have not seen anything similar to this arrangement in any other species of the genus. The significance of this organization is unknown.

Paratypes. BRAZIL. **Minas Gerais:** Ituiutaba, 28 Oct. 1951, *A. Macedo 3385* (SP, US); Mun. Ituiutaba, 25 Oct. 2003, *J. A. N. Batista, K. F. Pellizzaro, M. C. D. Macedo & J. B. Santos 1441* (CEN, K, MO, RB, SP).

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Literature Cited

Batista, J. A. N. & L. B. Bianchetti. 2003. Lista atualizada das Orchidaceae do Distrito Federal, Brasil. Acta Bot. Brasil. 17(2): 183–201.

Cogniaux, A. 1898–1902. Orchidaceae II. *Cyrtopodium*. Pp. 356–375 *in* C. F. P. Martius, A. G. Eichler & I. Urban (editors), Flora Brasiliensis. Vol. 3, Part 5. R. Oldenbourg, Munich.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Hoehne, F. C. 1942. Orchidaceas. *Cyrtopodium*. Pp. 8–35, tab. 4–23 *in* F. C. Hoehne (editor), Flora Brasilica. Vol. 12, Part 6. Secretaria da Agricultura, Indústria e Comércio de São Paulo, São Paulo.

IUCN. 2001. IUCN Red List Categories and Criteria. Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Menezes, L. C. 2000. Genus *Cyrtopodium*: Espécies brasileiras., Ed. IBAMA, Brasília.

Oliveira, R. S., J. A. N. Batista, C. E. B. Proença & L. B. Bianchetti. 1996. Influência do fogo na floração de espécies de Orchidaceae em cerrado. Pp. 61–67 *in* Anais do Simpósio Impacto das Queimadas sobre os Ecossistemas e Mudanças Globais. 3 Congresso de Ecologia do Brasil, Brasília-DF.

Ratter, J. A., J. F. Ribeiro & S. Bridgewater. 1997. The Brazilian cerrado vegetation and threats to its biodiversity. Ann. Bot. 80: 223–230.

Warming, E. 1884. Symbolae ad floram Brasiliae centralis cognoscendam. Part. 30. Orchideae 2. Videnskabelige Meddelelser fra den naturhistoriske Forening i Kjöbenhavn 5–8: 86–99.

A New Name in *Primula* (Primulaceae)

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Abstract. The name *Primula lactiflora* Turkevicz is a later homonym for a previously described taxon in Primulaceae. The new name *P. turkeviczii* Byalt is proposed as a replacement.

Key words: Central Asia, Kirghizia, Pamir-Alai, *Primula*, Primulaceae, Tadzhikistan.

In 1921, a new species of *Primula* from the Zeravshan Ridge in northern Tadzhikistan and southern Kirgizia was described by S. J. Turkevicz (Turkewicz, 1921) as *P. lactiflora* Turkevicz. However, this name is a later homonym of *Primula lactiflora* (Pallas) O. Kuntze (Kuntze, 1891) from the mountains of southern Siberia and Central Asia. The name *P. lactiflora* Turkevicz was used in *Conspectus Florae Asiae Media* (Kovalevskaja, 1986) and another regional flora (Zapryagaeva, 1984). *Primula lactiflora* (Pallas ex DC.) O. Kuntze is really a species of the genus *Androsace* (= *A. lactiflora* Pallas ex DC.). The epithet *P. lactiflora* Turkewicz must be replaced, according to ICBN, Article 53.1 (Greuter et al., 2000), and this new name is proposed here.

Primula turkeviczii Byalt, nom. nov. Replaced name: *Primula lactiflora* Turkevicz, in Notul. Syst. Herb. Hort. Petrop. 2: 13. 1921, non *Primula lactiflora* (Pallas ex DC.) Kuntze, 1891. *Auganthus lactiflorus* (Turkevicz) J. Soják, in Čas. Nár. Muz., Odd. Přír, 148, 3–4: 208. 1979 [1980]. TYPE: [Tadzhikistan.] Flora Serawschanica, Mogian, 4500 ped. (Zona shirokolistvennykh derev'ev). May 1893. *V. L. Komarov s.n.* (holotype, LE; isotype, LE). Figure 1.

Distribution. *Primula turkeviczii* is known as an endemic from the Pamir and Alai Mountains in Central Asia (southern Kirgizia and Tadzhikistan). It grows in archa (*Juniperus*) forests and mountain steppes, on stony slopes and under rocks at about 2200–3000 m elevation (Zapryagaeva, 1984; Kovalevskaya, 1986).

Phenology. Flowering May to June; fruiting June to July.

Etymology. The name is given in memory of S. J. Turkevicz, who was a great expert in the flora of Central Asia.

Primula turkeviczii differs from other species of *Primula* in this region by the corolla with milky white lobes and a dark violet tube and by its calyx with prominent nerves.

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Literature Cited

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Kovalevskaja, S. S. 1986. Fam. Primulaceae. Pp. 8–30 *in* A. I. Vvedensky (editor), Conspectus Florae Asiae Mediae, Vol. 8. USSR Academy of Sciences/Uzbek Academy of Sciences, Moscow [in Russian].

Kuntze, O. 1891. Revisio Generum Plantarum Vascularium, Vol. 1, Part 1. A. Felix, Leipzig, Dulau & Co., London; U. Hoepli, Milano; G. E. Stechert, New York; and C. Klincksiek, Paris.

Turkevicz, S. J. 1921. New species of *Primula* from Turkestan. Notul. Syst. Herb. Hort. Bot. Petrop. 2: 13–16 [in Russian and Latin].

Zapryagaeva, V. I. 1984. Fam. Primulaceae. Pp. 222–260 *in* P. N. Ovchinnikv (editor), Flora Tadzhikskoi SSR, Vol. 7. Nauka, Leningrad [in Russian].

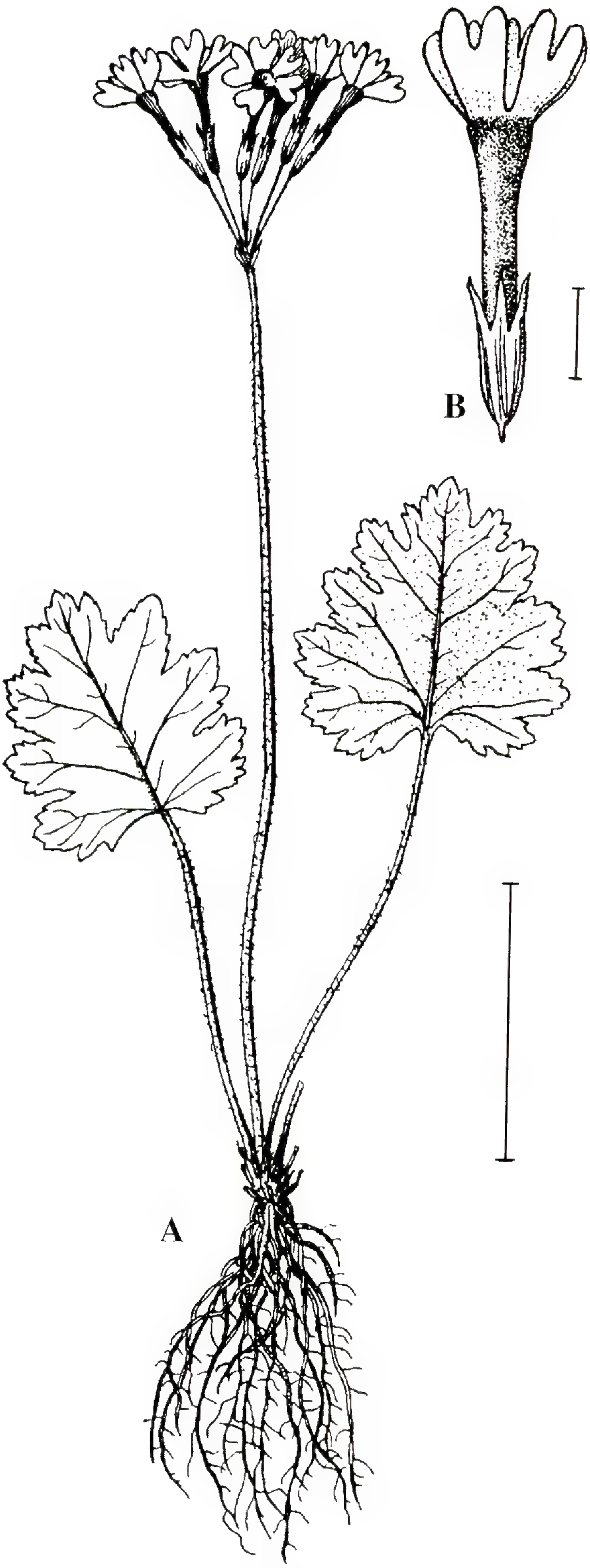

Figure 1. *Primula turkeviczii* Byalt. — A. Habit of plant. Scale = 5 cm. —B. Flower. Scale = 5 mm.

New Taxa of *Anthurium* (Araceae) from the Bajo Calima Region (Valle, Chocó), Colombia and Ecuador

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Abstract. Twenty-six new taxa (25 species and 1 variety) of *Anthurium* (Araceae) from Bajo Calima, Colombia, are described as new: *Anthurium albertiae* Croat & Bay, *A. arenasense* Croat & Bay, *A. barreranum* Croat & Bay, *A. bayae* Croat, *A. calimense* Croat & Bay, *A. coleorrhiza* Croat & Bay, *A. cordobense* Croat & Bay, *A. cylindratum* Croat & Bay, *A. fragrans* Croat & Bay, *A. hinoideum* Croat & Bay, *A. holquinianum* Croat & Bay, *A. isidroense* Croat & Bay, *A. joaquinense* Croat & Bay, *A. langendoenii* Croat & Bay, *A. lautum* Croat & Bay, *A. lygrum* R. E. Schultes ex Croat & Bay, *A. malagaense* Croat & Bay, *A. monticola* var. *attenuatum* Croat & Bay, *A. oxyanthum* Croat & Bay, *A. perviride* Croat & Bay, *A. phyllobaris* Croat & Bay, *A. remotum* Croat & Bay, *A. rubrivellus* Croat & Bay, *A. verrucosum* Croat & Bay, *A. wattii* Croat & Bay, and *A. wintersii* Croat & Bay.

Resumen. Se describen como nuevos 26 taxones (25 especies y 1 variedad) de *Anthurium* (Araceae) de Bajo Calima, Colombia: *Anthurium albertiae* Croat & Bay, *A. arenasense* Croat & Bay, *A. barreranum* Croat & Bay, *A. bayae* Croat, *A. calimense* Croat & Bay, *A. coleorrhiza* Croat & Bay, *A. cordobense* Croat & Bay, *A. cylindratum* Croat & Bay, *A. fragrans* Croat & Bay, *A. hinoideum* Croat & Bay, *A. holquinianum* Croat & Bay, *A. isidroense* Croat & Bay, *A. joaquinense* Croat & Bay, *A. langendoenii* Croat & Bay, *A. lautum* Croat & Bay, *A. lygrum* R. E. Schultes ex Croat & Bay, *A. malagaense* Croat & Bay, *A. monticola* var. *attenuatum* Croat & Bay, *A. oxyanthum* Croat & Bay, *A. perviride* Croat & Bay, *A. phyllobaris* Croat & Bay, *A. remotum* Croat & Bay, *A. rubrivellus* Croat & Bay, *A. verrucosum* Croat & Bay, *A. wattii* Croat & Bay y *A. wintersii* Croat & Bay.

Key words: *Anthurium*, Araceae, Bajo Calima, Colombia.

This manuscript describes 25 new species and 1 new variety of *Anthurium* (Araceae) from the Bajo Calima Region of Colombia, an area known to be a center of diversity for Araceae. The Bajo Calima region, covering roughly 80,000 ha., is a part of the Chocó phytogeographic region (Gentry, 1982; Prance, 1982) located between the latitudinal coordinates of 03°50′N and 04°10′N, and the longitudinal coordinates of 76°54′W and 77 48′W, and is classified as *Tropical rain forest* transition to *Premontane* (T-rf/P) (Holdridge, 1967; Holdridge et al., 1971). The area ranges from sea level to 150 m elevation, has a yearly average temperature above 24°C and average annual rainfall between 6000 and 8000 mm. Located on the Pacific Andean slopes of central Colombia, the region is known to be one of the centers of diversity for the family and has proven to have more species of Araceae than any other area ever studied to date. Fieldwork in the region, and the examination of herbarium specimens in three Colombian herbaria (CUVC, VALLE, and TULV), the Smithsonian Institution (US), and the Field Museum (F), as well as specimens at the Missouri Botanical Garden (MO), yielded 137 species of Araceae. Of these, 80 species were new to science at the initiation of this study, and there was one new variety. The largest genera represented in the Bajo Calima region (with numbers of species in parentheses) were *Anthurium* (50), *Philodendron* (47), *Stenospermation* (14), *Monstera* (5), and *Xanthosoma* (4). Other genera were: *Dieffenbachia*, *Rhodospatha*, and *Syngonium* with 3 species each; *Caladium* and *Spathiphyllum* with 2 species

each; and 1 species each of *Chlorospatha*, *Colocasia*, *Dracontium*, and *Homalomena*. Since other floristic projects are under way in the region, it is necessary to make these new species available to other workers. This paper deals with only new species of *Anthurium*. Illustrations of most species will be a part of a complete treatment of the Araceae of Bajo Calima to be published in the near future.

Anthurium is a Neotropical genus with well over 1000 species, occurring widely in the Neotropics, but heavily concentrated in the Andean areas, especially the wetter areas such as Bajo Calima and other parts of northwestern South America. The genus is characterized by having net-reticulated venation and bisexual flowers aggregated in spadices and subtended by a persistent spathe (Croat, 1983, 1986; Mayo et al., 1997). Special terminology in descriptions follows that defined by Croat and Bunting (1979).

Anthurium albertiae Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 31.5, less than 100 m, 6 Feb. 1990, *T. B. Croat & J. Watt 70282* (holotype, MO-3784031; isotypes, B, COL, CUVC, K, NY, US).

Planta epiphytica, raro terrestris; internodia 5–10 mm longa, 1–2.2 cm diam., cataphylla 9.5–15.5 cm longa, persistentia ut fibrae paucae grossae; petiolus 9–29.5 cm longus, subteres, subcomplanatus adaxialiter, leniter vel obtuse sulcatus; lamina anguste oblonga-elliptica vel anguste ovato-elliptica, 26–59 cm longa, 4.5–13.5(–18) cm lata, hebetata in superficiebus ambabus; nervis lateralibus 11–25 ad 33 utroque; nervis collectivis 3–4 mm a marginibus, a nervis lateralibus 1 tertiis vel quintis oriundis; pedunculus 10–31.5 cm longus; spatha linear-lanceolata, 6.3–13 cm longa, 8–20 mm lata, virens aut flavoviridis; spadix sessilis, 6–14 cm longus, pallide viridis; baccae virides.

Epiphytic, rarely terrestrial; stems short; *internodes* 5–10 mm × 1–2.2 cm, semiglossy, medium green; roots few per node; *cataphylls* 9.5–15.5 cm long, weathering to a few coarse, pale, persistent fibers. LEAVES erect-spreading; *petioles* 9–29.5 cm × 2–5 mm (dry), subterete, somewhat flattened adaxially, weakly to obtusely sulcate, weakly glossy, medium green, drying pale green; geniculum 1–2 cm long, sharply sulcate, somewhat swollen, drying concolorous; *blades* 26–59 × 4.5–13.5(–18) cm, subcoriaceous, oblong-narrow elliptic to ovate-narrow elliptic, narrowly to broadly rounded at base, acuminate at apex, (2.7–)4.3–6.6 times longer than wide, (1.7–)2.3–2.6(–3.3) times longer than petioles, usually widest near middle, upper surface matte to lustrous-velvety, dark green, drying dull to semiglossy and medium green, lower surface matte, paler than above, drying semiglossy and paler; major veins drying concolorous and barely raised in shallow valleys above, paler and acute to round-raised below; *midrib* convex, slightly paler above, round-raised, paler below; *primary lateral veins* 25 to 33 per side, departing midrib at a 45–55° angle, slightly curving to collective veins, sunken above, convex below; collective veins 3–4 mm from blade margin, originating from 3rd to 5th primary lateral vein; tertiary veins reticulate, obscure above, slightly raised, sometimes darker below. INFLORESCENCES erect; *peduncle* 10–31.5 cm × 2–3 mm (dry), about as long as petiole, light green, drying pale green; *spathe* spreading to reflexed, linear-lanceolate, 8–20 mm wide, 6.3–13 cm long, medium green or sometimes yellowish green, acuminate, acumen apiculate; *spadix* sessile, cylindrical, slightly tapered at apex, 6–14 cm × 3–5 mm (dry), semiglossy, pale green. Flowers square, 1.6–1.8 × 1.4–1.6 mm, strongly exserted, margins becoming membranaceous and somewhat undulate in fruit; stigma oval. INFRUCTESCENCE to 16 cm long; *berries* early-emergent, green (immature), acute at apex.

The species is known only from the Bajo Calima region of Colombia, in the Department Valle, occurring in *Tropical wet forest* transition to *Premontane* (T-wf/P) life zone (Holdridge et al., 1971), below 150 m.

Anthurium albertiae is a member of section *Polyneurium* Engler and is characterized by oblong-narrow elliptic to ovate-narrow elliptic blades, usually matte on both sides, many primary lateral veins, and pale green spadices.

The species is similar to *Anthurium lygrum*, also occurring in the Bajo Calima region, that differs in having blades that are always oblong-narrow elliptic (never ovate-narrow elliptic) and acute at the base, fewer primary lateral veins (11 to 12 compared to 25 to 33 in *A. albertiae*), and petioles with acutely erect margins adaxially and three acute ribs abaxially.

The species is named in honor of the late American botanist Linda Katherine Albert de Escobar, long a professor at the Universidad de Antioquia, who collected throughout much of northwestern Colombia (especially Antioquia) and made the earliest known collection of the species.

Anthurium albertiae was collected in flower in the Bajo Calima region in February, March, and July, and in fruit in February.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Albert de Escobar et al. 1011* (HUA); km 37, *Croat 69369* (CUVC, MO), *69372* (CUVC); km 51.3, *Croat & Watt 70398* (CUVC, MO); *Croat 71016* (F, JAUM, MO, VEN); km 51.7, *Croat & Bay 75791* (CUVC, G, GH, MO, USM), *75796.1* (MO).

Anthurium arenasense Croat & Bay, sp. nov. TYPE: Colombia. Valle: Punta Arenas, N shore of Buenaventura Bay, 2 June 1944, *E. P. Killip & J. Cuatrecasas 38642* (holotype, US).

Planta epiphytica; internodia 2.5–6.5 cm longa, plerumque obtecta fibris cataphyllorum; cataphylla 7.5–8 cm longa, persistentia intacta a nodis superioribus, ut reticulum fibrorum decompositorum a nodis inferioribus; petiolus 5.5–8.5 cm longus, teres, anguste sulcatus adaxialiter; lamina ovata vel rotunda, 7–9 cm longa, 4–6.6 cm lata, minute nigropunctata in superficiebus ambabus; nervis lateralibus I 18 ad 25 utroque; nervis collectivis I completis, 2 partialibus; pedunculus 15–16 cm longus; spatha 3–4.5 cm longa, atroviridis; spadix stipitatus usque 1–3 mm, 3.5–3.8 cm longus, viridalbus; infructescentia ignota.

Epiphytic; stem scandent; *internodes* 2.5–6.5 cm × 5–8 mm (dry), drying smooth, light tan, often covered with cataphyll fibers; roots few per node, drying reddish brown; *cataphylls* 7.5–8 cm long, persisting intact at upper nodes, weathering to a net-like reticulum of fibers at lower nodes, often covering internodes, drying light reddish tan. LEAVES erect-spreading; *petioles* terete, narrowly sulcate adaxially, 5.5–8.5 cm × 1.5–2 mm (dry); *blades* coriaceous, ovate to round, apiculate at apex, attenuate at base, 7–9 × 4–6.6 cm, 1.2–1.9 times longer than wide, 0.9–1.5 times longer than petiole, upper and lower surfaces minutely black-punctate, drying dull and pale olive-green, slightly paler below; *midrib* drying raised, paler on both surfaces; *primary lateral veins* 18 to 25 per side, departing midrib at a 40 –60° angle, straight to innermost collective vein; innermost collective vein 1–1.8 cm from blade margin, second collective vein 3–8 mm from blade margin, third collective vein marginal or 2–3 mm from blade margin in lower 1/3 of blade; tertiary veins parallel. INFLORESCENCES erect; *peduncle* 15–16 cm long, drying pale tan; *spathe* spreading to reflexed, 3–4.5 cm long, deep green, drying olive-green; *spadix* stipitate 1–3 mm, cylindrical, 3.5–3.8 cm × 3–4 mm (dry), greenish white. Flowers square, 1.5 × 1.5 mm; thecae ovoid, ca. 0.15 mm long. INFRUCTESCENCES unknown.

The species is known only from the Bajo Calima region of Colombia in the Department Valle, occurring in the *Tropical wet forest* transition to *Premontane* (T-wf/P) life zone, near sea level. It was collected along the shore of Buenaventura Bay in dense forest.

Anthurium arenasense is a member of section *Tetraspermium* Schott and is characterized by its ovate to round blades that are minutely black-punctate on both surfaces with three collective veins, petioles that are usually slightly longer than the blades, and short, greenish white, cylindrical spadices.

Anthurium arenasense is most easily confused with *A. trinerve* Miquel, which also occurs in the Bajo Calima region, and *A. scandens* (Aublet) Engler that does not. Both of these differ in having more elliptic blades, only one collective vein at any distance from the blade margin, one marginal collective vein, and a tapering spadix.

Luteyn & Silverstone-Sopkin 12273 from El Cairo, near the Chocó-Valle border, at 1750 m, is quite similar to *Anthurium arenasense*. However, the *Luteyn & Silverstone-Sopkin* specimen differs in having larger, rather elliptic, blades, and dark maroon spadices.

Anthurium arenasense is named for Punta Arenas, the site of the earliest known collection.

It was collected in flower in June.

Paratype. COLOMBIA. **Valle:** dense forest along Buenaventura Cali hwy., near sea level, 10 June 1944, *Killip & Cuatrecasas 39168* (US).

Anthurium barreranum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 49, 17 July 1993, *T. B. Croat & D. Bay 75830* (holotype, MO-4576851; isotype, CUVC).

Planta epiphytica aut terrestris; internodia usque 1 cm longa; cataphylla 3–10 cm longa, 1-costata, decidua; petiolus 20–31 cm longus, teres, interdum 1-costatus adaxialiter; lamina ovata, cordata basi, 20–28 cm longa, 9.5–11 cm lata, nitida in superficiebus ambabus; nervis basalibus 3 ad 4 utroque, omnibus liberis ad basim; nervis lateralibus 16 ad 7 utroque; nervis collectivis 3–5 mm a marginibus, a nervis basalibus primis oriundis; pedunculus usque 15 cm longus; spatha usque 10 cm longa, pallide virida; spadix atropurpureus; infructescentia ignota.

Epiphytic or terrestrial; stem short; *internodes* to 1 cm long, 5–9 mm diam., semiglossy to glossy, smooth, medium green, drying pale tan; roots few per node; cataphylls 3–10 cm long, 1-ribbed, medium green, drying medium brown, deciduous. LEAVES erect-spreading; *petioles* 20–31 cm × 2–3 mm (dry), terete, sometimes 1-ribbed adaxially, matte, medium green, drying medium brown; geniculum 8–15 mm long, drying darker than petiole; *blades* subcoriaceous, ovate, abruptly long-acuminate at apex, cordate at base, 20–28 × 9.5–11 cm, 2.1–2.7 times longer than wide, 0.8–1 times as long as petiole, upper surface semiglossy to glossy, medium green, drying glossy and medium brown, lower surface semiglossy and slightly paler, drying glossy and slightly paler; anterior lobe 26–18 × 9.5–11 cm, 5.1–10.2 times longer than posterior lobes; posterior lobes 2.6–4 × 2.5–5 cm, rounded; sinus 1.5–3 cm deep; major veins drying concolorous, barely raised above, darker than surface, round-raised below; *midrib* narrowly raised,

paler above, convex, paler below; *primary lateral veins* 6 to 7 per side, departing from midrib at a 35 –45 angle, gradually curving to collective veins, narrowly sunken above, narrowly and acutely raised, paler below; *basal veins* 3 to 4 per side, free to base; collective veins 3–5 mm from blade margin, originating from first basal vein; tertiary veins barely visible above, slightly raised below. INFLORESCENCE erect; *peduncle* to 15 cm × 1–3 mm (dry), terete, medium green, drying brown; *spathe* to 10 cm long, light green; *spadix* lost, described as dark purple. INFRUCTESCENCE unknown.

The species is known only from the Bajo Calima region, occurring in *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 150 m, in regrowth and primary forests.

Anthurium barreranum is a member of section *Calomystrium* Schott, and is characterized by terete petioles, small ovate-cordate, acuminate blades, free basal veins, and inflorescences borne on short peduncles with dark purple spadices. All parts of the plants are medium brown upon drying. The species is similar to several other species with deeply cordate blades with non-naked posterior ribs and with petioles more than 20 cm long. It differs from *A. pluriaticum* R. E. Schultes and *A. phyllobaris* by having glossy blades (matte in *A. pluriaticum* and *A. phyllobaris*). As a member of section *Calomystrium*, the species should be compared to two other moderately small species in that section at Bajo Calima. Both *A. fragrans* and *A. obtusifolium* differ from *A. albertiae* in having prominent posterior lobes with the basal veins united in part into a posterior rib.

The species is named in honor of Carlos Barrera, an official of Cartón de Colombia who graciously afforded the authors, Tom Croat and Dorothy Bay, the opportunity to work in the lumber concession and to use their facilities to process and dry plants.

Anthurium barreranum was collected in flower in July.

Paratype. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 51.3, *Croat & Watt 70412* (MO).

Anthurium bayae Croat, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 51.7, 16 July 1993, *T. B. Croat & D. Bay 75798* (holotype, MO-4573844; isotypes, CUVC, US).

Planta epiphytica; internodia 5–10 mm longa, 1–3 cm diam.; cataphylla 5.5–18 cm longa, persistentia semi-intacta; petiolus 16.5–32.5 cm, 2–4 mm diam., acute C-formatus, obtuse complanatus adaxialiter, inconspicue sulcatus, interdum inconspicue 1-costatus, hebetatus; lamina triangulari-ovata, subcordata basi, 32.8–40 cm longa, 10–15 cm lata, leniter nitida vel hebetata supra, hebetata infra; nervis basalibus 3 ad 5 utroque, omnibus liberis ad basim; nervis lateralibus 1–9 ad 12 utroque; nervis collectivis 3–4 mm a marginibus, a nervis basalibus primus oriundis; pedunculus usque 8 cm longus; spatha viridis; spadix sessilis, usque 19 cm longus, hebetatus, albus; infructescentia ignota.

Epiphytic; stem short; *internodes* 5–10 mm × 1–3 cm, medium green, drying pale white; roots few per node, stout; *cataphylls* 5.5–18 cm long, persisting semi-intact, drying pale tan. LEAVES erect-spreading; *petioles* 16.5–32.5 cm × 2–4 mm (dry), sharply C-shaped, broadly flattened adaxially, faintly sulcate, sometimes with a faint medial rib, matte, light green, drying pale green; geniculum slightly swollen, 1–1.5 cm long, drying concolorous; *blades* subcoriaceous, triangular-ovate, acuminate at apex, subcordate at base, 32.8–40 × 10–15 cm, 2.5–3.5 times longer than wide, 1.1–2.1 times longer than petiole, broadest at base, upper surface weakly glossy to matte, drying semiglossy, pale green, lower surface matte, paler, drying semiglossy and barely paler than above; major veins drying concolorous and barely raised above, round-raised and white below; sinus triangular, shallow, often with nearly straight margins; *midrib* acute, barely paler above, round-raised, paler below; *primary lateral veins* 9 to 12 per side, departing midrib at a 40 –50 angle, ± straight to collective veins, narrow-raised, paler above, convex below; *basal veins* 3 to 5 per side, free to base; the innermost forming a single pair of collective veins 3–4 mm from blade margin, originating from 1st basal vein; tertiary veins reticulate, obscure. INFLORESCENCES erect; *peduncle* to 8 cm long, to 3 mm diam. (dry), shorter than petiole; *spathe* spreading, green; *spadix* sessile, cylindrical, gradually tapered, to 19 cm long, to 5 mm diam. (dry) at base, to 3 mm diam. (dry) at apex, white, matte. Flowers rhombic, 1.6–1.9 × 1.2–1.5 mm; tepals with margins exserted; stigma about 0.1 mm long, linear; thecae oval, to 0.2 mm long. INFRUCTESCENCE unknown. JUVENILE plants with blades oblong-elliptic, 5–6 times longer than broad, acute at base, becoming rounded to truncate to cordulate.

The species is known only from the Bajo Calima region, Valle, Colombia, in *Tropical wet forest* transition to *Premontane* (T-wf/P), below 150 m; it was collected in regrowth forests.

Anthurium bayae is a member of section *Belolonchium*, and is characterized by triangular-ovate blades, basal veins that are all free to the base and not forming posterior ribs, long cataphylls persisting semi-intact, collective veins originating from the first basal vein, and long white spadices borne on short peduncles.

The species is similar to *Anthurium panamense* Croat, also occurring in the Bajo Calima region, which has pre-adult blades that could easily be confused with *A. bayae*. The former species differs, however, in having adult blades that are much larger and deeply cordate with well-developed naked posterior ribs, and deciduous cataphylls.

The species is named in honor of Dorothy Bay of Missouri Southern State University, Joplin, Missouri, who conducted her Ph.D. studies at St. Louis University on the Araceae of Bajo Calima and personally collected many of the species involved in this project, including the type specimen.

Anthurium bayae was collected in flower in July.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 22, Carretera Hanz, *Croat 69523* (CUVC, MO); 4.5 km W of km 28, *Bay 238* (CUVC, MO).

Anthurium calimense Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 52.4, 14 July 1993, *T. B. Croat & D. Bay 75733* (holotype, MO-4577516; isotypes, CUVC, K, US).

Planta epiphytica, interdum terrestris; internodia 5–20 mm longa, 6–15 mm diam.; cataphylla 6–12(15) cm longa, persistentia ut reticulum fibrorum decompositorum; petiolus 4.5–12(14.5) cm longus, C- aut D-formatus, plerumque marginibus acutis, interdum 1-costatus adaxialiter, interdum fuscopunctatus; lamina elliptica aut ovata, plerumque cuneata, interdum attenuata, raro obtusa basi, (13.5)18–30 cm longa, (3.8)6–12.5 cm lata, nitida et minute nigropunctata supra, nitida et minute brunneopunctata, saepe pustulata infra; nervis lateralibus I multis; nervis collectivis I 8–15 mm a marginibus, nervis collectivis II in 1/4–1/2 parte inferiore laminae; pedunculus 13–33 cm longus; spatha 3.5–8 cm longa, virens; spadix sessilis, nitidus, 7.5–13 cm longus, canovirens, tum flavus; infructescentia 12–18 cm longa; baccae violaceorubrae.

Epiphytic or sometimes terestrial; stem appressed-climbing; *internodes* short, 5–20 × 6–15 mm, drying gray-brown; roots several per node; *cataphylls* 6–12(15) cm long, persisting in a net-like reticulum of fibers, drying gray to light brown. LEAVES erect-spreading to spreading; *petioles* 4.5–12(14.5) cm × 2–5 mm (dry), C- or D-shaped, usually with sharp erect margins, often with a medial rib adaxially, weakly glossy, medium green, sometimes visibly dark-punctate, drying olive-green; geniculum 3–8 mm long, drying slightly swollen, slightly darker than petiole; blades subcoriaceous to coriaceous, elliptic to ovate, abruptly long-acuminate at apex, usually cuneate, sometimes attenuate, rarely obtuse at base, (13.5)18–30 × (3.8)6–12.5 cm, 2.2–3(3.7) times longer than wide, (1.8)2–3.1 times longer than petiole, broadest near middle, upper surface glossy to semiglossy, dark green, minutely and moderately sparsely black-punctate, drying dull olive-brown, lower surface glossy to semiglossy, moderately paler than above, sometimes yellow-green, minutely dark brown punctate, often pustulate, drying dull or sometimes glossy, barely paler than above; *midrib* convex, paler above and below; *primary lateral veins* 12 to 16 per side, departing midrib at a 35°–45° angle, ± straight to innermost collective vein; collective veins 8–15 mm from margin, tapering slightly at apex and base, often a second collective vein in lower 1/4–1/2 of blade, drying more conspicuously raised than primary lateral veins on both surfaces; tertiary veins reticulate. INFLORESCENCES erect; *peduncle* 13–33 cm × 2–4 mm, longer than petiole, medium green, drying olive-green; *spathe* reflexed, 3.5–8 cm long, medium green, drying olive-green, acuminate at apex; *spadix* sessile, cylindrical, glossy, 7.5–13 cm × 3–4 mm, gray-green becoming yellow at anthesis, dark purple in fruit. Flowers usually 4-lobed or sometimes rhombic, 2.6–2.8 × 2.0–2.2 mm; tepals glossy, granular on the surface (under 10 × magnification); *pistils* square, 4–5 mm long and wide; stigma 2–3 mm long, linear; stamens not exserted beyond pistils. INFRUCTESCENCES 12–18 cm long, often infertile for 1–3 cm at apex; *berries* subglobose, to 4 mm long, violet-red; seeds 2 per berry.

The species is known only from the Bajo Calima region, occurring in *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 150 m, in regrowth and primary forests.

Anthurium calimense is a member of section *Porphyrochitonium* Schott, and is characterized by short petioles, which usually have sharp erect margins and a medial rib adaxially, ovate or elliptic blades that are punctate on both surfaces and pustulate on the lower surface, and especially by the glossy yellow spadices. The species is quite similar to *A. bicollectivum* Croat from Panama, which differs in having blades which are usually matte, subterete petioles that are deeply sulcate and lacking a medial rib, a spadix with matte tepals, and yellow-orange berries.

Anthurium calimense is named for the Bajo Calima region, throughout which it occurs.

It was collected in flower in January, February, July, August, and September, and in fruit in February, July, September, and December.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Kennedy 760* (MO), *Monsalve 188* (MO), *290* (CUVC, MO), *1075* (MO), *1193* (MO), *1444* (MO), *1616* (CUVC), *1682* (MO), *1814* (MO), *Gentry 35334* (MO), *Gentry & Juncosa 40525* (MO), *Gentry et al. 40294* (MO), *53874* (CUVC, MO), *57095* (MO), *Juncosa 2124A* (MO), *Croat 69449* (CUVC, MO), *69451* (CUVC, MO), *69452* (CUVC, MO); km 14, *Croat* (CUVC, MO); km 22, Carretera Hanz, *Croat 69526* (CUVC, MO), *69538* (CUVC, MO); km 33.3, *Croat*

61301 (MO), *61356* (COL, CUVC, MO), *61382* (B, CUVC, MO), *61387* (CUVC); km 44, *Croat & Watt 70208B* (MO); km 50.7, *Croat & Bay 75674* (CUVC, MO); km 52.4, *Croat & Bay 75732* (CUVC, MO); km 65–66, *Croat* (CUVC, MO), *Deria 3046* (TULV); San Isidro, *Deria & Prado 2852* (TULV); Bahía Málaga, vic. Base Naval Málaga, along rd. to Buenaventura, ca. 1 km from base ca. km 101, *Croat & Gaskin 80460* (CUVC, MO).

Anthurium coleorrhiza Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 11, 14 July 1993, *T. B. Croat & D. Bay 75837A* (holotype, MO-4619383).

Planta terrestris; internodia 1–2 cm longa; cataphylla 15–21 cm longa, persistentia intacta, patentia lateraliter, radices includentia; petiolus 21–37.5 cm longus, teres aut acute C-formatus, anguste sulcatus adaxialiter; lamina ovata, subcordata basi, 18–34 cm longa, 11–22 cm lata, nitida in superficiebus ambabus, minute rubrobrunneopunctata infra; nervis basalibus 2 ad 3 utroque, omnibus liberis ad basim; nervis lateralibus 1–8 ad 12 utroque; nervis collectivis 2–3 mm a marginibus, a nervis basalibus secundis aut tertiis oriundis; pedunculus 9.5–13.5 cm longus; spatha usque 9.5 cm longa, pallide viridis aut albida; spadix 7–7.6 cm longus, pallide viridalbus, tum purpureus in fructescentia; baccae virides, tum purpureae a maturite.

Terrestrial; stem short, decumbent; *internodes* 1–2 cm long, to 1.5 cm diam.; *cataphylls* 15–21 cm long, persisting intact, reddish brown, spreading laterally and enclosing roots. LEAVES erect; *petioles* 21–37.5 cm × 3–5 mm (dry), terete or sharply C-shaped, narrowly sulcate adaxially, light green, drying reddish brown; geniculum 1–2 cm long, swollen, pale green to white; *blades* subcoriaceous, ovate, acuminate at apex, subcordate at base, 18–34 × 11–22 cm, 1.3–1.7 times longer than wide, 0.8–1(1.2) times longer than petiole, upper surface semiglossy to glossy, dark green, drying dull and medium brown, lower surface semiglossy, slightly paler than above, minutely red-brown-spotted (visible with 10 × magnification), drying glossy and paler than above; major veins drying concolorous, barely raised above, dark reddish brown, prominently raised below; *midrib* narrowly convex above, convex and paler below; basal veins 2 to 3 per side, free to base; *primary lateral veins* 8 to 12 per side, departing midrib at a 40–55° angle, gradually curving to collective veins, sunken above, convex below; interprimary veins parallel, almost as prominent as primary lateral veins; collective veins 2–3 mm from blade margin, originating from 2nd or 3rd basal vein; tertiary veins reticulate. INFLORESCENCES erect; *peduncle* 9.5–13.5 cm × 2–3 mm (dry), pale green to white; *spathe* to 9.5 cm long, long-acuminate, erect at anthesis, pale green to white; *spadix* 7–7.6 cm × 4–6 mm (dry), cylindrical, bluntly rounded at apex, pale greenish white, becoming purple in fruit. Flowers rhombic, 1.7–4 mm long, 1.9–2.8 mm wide. INFRUCTESCENCE erect; to 7 cm long; *berries* early-emergent, green becoming purple.

The species is known only from the Bajo Calima region in Valle and Chocó Departments, occurring in the *Tropical wet forest* transition to *Premontane* (T-wf/P) life zone, from sea level to 150 m, in regrowth and primary forests.

Anthurium coleorrhiza is a member of section *Calomystrium*, and is easily recognized by its long, persistent, reddish brown cataphylls, which spread laterally and enclose the roots. The specific epithet refers to this: "coleo" means sheathed and "rhiza" means root. Also characteristic are slender petioles usually longer than the blades, subcordate ovate blades that are minutely red-brown-spotted (under 10 × magnification), and the blunt white spadices with pale greenish white spathes.

The species is somewhat similar to *A. holquinianum* (described below), also found in the Bajo Calima region, which differs in having cataphylls that become fibrous and remain close to the stem upon drying, shorter petioles, blades that are slightly more elongate and longer than the petioles, and are matte and lacking spots on the lower surface.

Anthurium coleorrhiza was collected in flower in April (Chocó) and in fruit in February (Valle).

Paratypes. COLOMBIA. **Chocó:** Quibdó–Lloro rd., about 1 km S of ferry over Río Atrato, *Croat 53982* (CUVC, MO); Quibdó Istmina rd., S of Río Rancherita, km 31–32, *Croat 57363* (CUVC, MO). **Valle:** Buenaventura–Málaga rd., km 9, *Croat 70122A* (CUVC, MO); km 18, *Croat* (CUVC, MO); km 11, *Croat & Watt 70202* (CUVC, MO).

Anthurium cordobense Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 50.7, 12 July 1993, *T. B. Croat & D. Bay 75683* (holotype, MO-4572117; isotypes, CUVC, US).

Planta epiphytica; internodia brevia, usque 3 cm diam.; radices ramosissimae, formantes massam densam; cataphylla usque 8 cm longa, persistentia ut fibrae decompositae; petiolus 3.3–15 (19) cm longus, obtuse sulcatus adaxialiter, anguste rotundatus abaxialiter; lamina anguste obovata, obtusa basi, 26–47.5 cm longa, 7–15 cm lata, latissima ultra medium, nitida et obscure punctata supra, leniter nitida, minute fusco-punctata infra; nervis lateralibus 14–17 ad 20 utroque; nervis collectivis 1.4–6 mm a marginibus, interdum nervis collectivis II in inferiore 1/10–1/5 laminae; pedunculus 23–40 cm longus; spatha 4.5–8 cm longa, plerumque viridis, interdum rubella; spadix sessilis, 9.5–21 cm longus, aureus vel aurantiacus; infructescentia usque 22 cm longa; baccae aurantiacae.

Epiphytic; stem short; *internodes* to 3 cm diam.; roots highly branching, forming a dense mass;

cataphylls to 8 cm long, persisting as weathered fibers, drying brown. LEAVES erect-spreading; *petioles* 3.3–15(19) cm × 4–8 mm (dry), D-shaped, obtusely sulcate adaxially, narrow-rounded abaxially, medium green; geniculum to 2.5 cm long, drying darker than petiole; *blades* moderately coriaceous, narrowly obovate, short-acuminate to abruptly short-acuminate at apex, usually obtuse, sometimes attenuate at base, 26–47.5 × 7–15 cm, (2.7)3.1–4.4 times longer than wide, (2.9–3.6)5.4–11 times longer than petiole, broadest beyond middle, upper surface semiglossy, dark green, obscurely punctate, drying dull and light brown, lower surface weakly glossy to matte, paler than above, minutely dark-punctate, drying semiglossy and paler; *midrib* convex and concolorous above, convex and paler below; *primary lateral veins* 17 to 20 per side, departing midrib at a 60°–70° angle, straight to collective veins, sunken above, raised below, drying slightly raised above, raised and darker than surface below; innermost collective veins 4–6 mm from margin, sometimes forming a second collective vein in the basal 1/10–1/5 of the blade; tertiary veins reticulate, less conspicuous than primary lateral veins. INFLORESCENCES pendent; *peduncle* 23–40 cm × 1–3 mm (dry), shorter than petiole, green, drying yellowish brown to reddish brown; *spathe* spreading to reflexed, 4.5–8 cm long, usually green, sometimes reddish, drying olive-green to reddish brown; *spadix* sessile, cylindrical, 9.5–21 cm × 3–7 mm (dry), golden yellow to reddish orange. Flowers rhombic, 2.6–3.3 × 1.8–2.4 mm; *pistils* to 1.5 × 0.8 mm; stigma ca. 0.6 mm long, oval; thecae ovoid, 2–3 mm long. INFRUCTESCENCE to 22 cm long; *berries* orange.

The species ranges along the Pacific slopes of Colombia from the Río San Juan in the Chocó Department to the lower Río Mira in the Nariño Department. It occurs in *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 200 m. In the Bajo Calima region it was collected in primary forest and from older regrowth forests, usually close to streams.

Anthurium cordobense is a member of section *Porphyrochitonium* and is distinguished by its large root mass, narrowly obovate blades, short obtusely sulcate petioles, and yellow-orange spadices with orange berries.

Anthurium cordobense is quite similar to *A. filiforme* Engler, which also occurs at Bajo Calima, and differs in having more slender roots, smaller parts, shorter petioles and spadices, and no punctations on the upper surface of the blade.

Another species that is similar to *A. cordobense* is *A. ramonense* Engler ex K. Krause, a species that ranges from Nicaragua to Colombia, which differs in having longer petioles, peduncles, and spadices, blades elliptic with attenuate bases, and red to purple berries.

Also similar to *A. cordobense* is *A. rodrigueziae* Croat, from Pichincha Province in central Ecuador, which differs in having leaf blades with obvious punctations on the upper surface, less conspicuous primary lateral veins, and purple or violet-spotted petioles and peduncles.

An undetermined specimen, *Croat 70296A* from the Bajo Calima region, differs in having a longer petiole and blade, as well as a spadix which is nearly 70 cm long, and was described as tan in life rather than yellow or orange. *Anthurium cordobense* is named for the village of Córdoba in Valle Department, where the earliest collection was made.

Anthurium cordobense was collected in flower in the Bajo Calima region in February, May, July, and November, and in fruit in April.

Paratypes. COLOMBIA. **Chocó:** jct. of Río Condoto and Río San Juan, *Killip 35088* (US); Corcovado Region, upper Río San Juan, Yeracui Valley, *Killip 35237* (COL); Río San Juan, *Forero et al. 9508* (MO); Tutunendo–Icho hwy., 60 m, *Juncosa 1217* (MO). **Nariño:** Río Timbiquí, *Lehmann 869* (K); Gorgona Island, "*St. George*" *Expedition 321* (K); *564* (K); Río Mira, *Kennedy 195* (DUKE). **Valle:** Buenaventura–Málaga rd., km 11, *van Rooden et al. 407* (MO); *Monsalve 999* (CUVC, MO); km 18, *Croat 61355* (CUVC, MO); km 37, *Croat 69386* (CUVC); km 42–43, *Croat & Watt 70296* (CUVC, MO); km 49, *Croat & Bay 75829* (CUVC, MO); km 50.5, *Croat & Watt 70330* (CUVC, MO); Córdoba, *Killip 5110* (NY); La Trojita, *Cuatrecasas 16479A* (VALLE); Quebrada La Sierpe, near Palestina, *Forero et al. 3972* (MO); Buenaventura Bay, mangrove thickets along coast, *Killip 5232* (G, NY), *11758* (NY); Río Cajambre, Quebrada del Corosal, *Cuatrecasas 17727* (F); vic. of Bahía Málaga, near Base Naval Málaga, along trail along the edge of the bay W of base headquarters, *Croat & Gaskin 80582* (CUVC, MO), *80582A* (CUVC, MO).

Anthurium cylindratum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 33.3, 6 July 1986, *T. B. Croat 61294* (holotype, MO-3434992; isotypes, CUVC, US).

Planta epiphytica; internodia brevia, usque 3 cm diam.; cataphylla persistentia fibrae tenuae decompositae; petiolus 35–37 cm longus, teres; lamina ovata, subcordata basi, 34.5–36 cm longa, 20–21.5 cm lata, subnitida supra, subnitida, minute nigropunctata infra; nervis lateralibus I 14 ad 16 utroque; nervis intralateralibus paene tam prominentibus quam nervis lateralibus I; nervis collectivis I 1.8–2.5 cm a marginibus a basi; 7–8 mm a marginibus in parte superiore; nervis collectivis II 5–10 mm a marginibus nonnisi a basi; pedunculus usque 10.5 cm longus; spatha usque 4.5 cm longa; spadix sessilis, cylindricus, hebetatus, usque 15 cm longus, pallide virens; infructescentia ignota.

Epiphytic; stem short; *internodes* short, to 3 cm diam.; *cataphylls* persisting as thin fibers, reddish brown. LEAVES erect to spreading; *petioles* 35–37 cm × 4–6 mm (dry), terete, stiff, light green, drying pale tan; geniculum 1.5–2 cm long, drying dark brown; *blades* coriaceous, ovate, obtuse-apiculate at apex, subcordate at base, 34.5–36 × 20–21.5 cm, 1.6–1.8 times longer than wide, 0.9–1 times longer than petiole, upper surface semiglossy, moderately bicolorous, drying dull and pale tan, lower surface semiglossy, minutely black-punctate, punctations infrequent, drying semiglossy and barely paler than above; major veins drying concolorous on both sides, slightly raised above, prominently raised below; *midrib* convex, paler on both sides; *primary lateral veins* 14 to 16 per side, departing midrib at a 55 –65 angle, gradually curving to collective veins; interprimary veins nearly as prominent as primary lateral veins; collective veins 1.8–2.5 cm from blade margin in lower 1/4 of blade, 7–8 mm from blade margin in upper 3/4 of blade, second collective vein 5–10 mm from blade margin in basal lobes; tertiary veins obscure. INFLORESCENCE spreading; *peduncle* 10.5 cm × 3–4 mm (dry); *spathe* reflexed, 4.5 cm long; *spadix* cylindrical, matte, to 15 cm long, pale to medium green, drying golden tan. Flowers square to rhombic, 2.2–2.7 × 2.0–2.4 mm; stigma linear, 0.1–0.2 mm long. INFRUCTESCENCE unknown.

The species is known only from the Bajo Calima region in the Valle Department, occurring in the *Tropical wet forest* transition to *Premontane* (T-wf/P) life zone, from sea level to about 100 m. It was collected in primary forest and near the Río Calima.

Anthurium cylindratum is a member of section *Porphyrochitonium* and is characterized by terete petioles, subcordate ovate blades which are minutely black-punctate on the lower surface, and stout, light green, cylindrical spadices (hence the name "cylindratum").

The species is closest to *Anthurium caucanum* Engler var. *maximum* Engler in terms of its blade shape and glandular punctations, but that taxon has proportionately more elongated, dark reddish brown-drying blades that are more conspicuously glandular-punctate, and a much longer, more slender spadix. In addition, it occurs at 450–2256 m elevation.

It was collected in flower in June and July.

Paratype. COLOMBIA. **Valle:** La Granja Agroforestal, *Cabrera 16225* (CUVC).

Anthurium fragrans Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 50.7, 12 July 1993, *T. B. Croat & D. Bay 75699* (holotype, MO-4575787; isotypes, B, CAS, COL, CUVC, F, K, NY, PMA, QCNE, US, VEN).

Planta epiphytica aut terrestris; internodia 1–6(10) cm longa, 0.5–3 cm diam.; cataphylla 11–30 cm longa, persistentia intacta basi aut fibrae tenuis; petiolus 33–68.5 cm longus, teres, anguste sulcatus; lamina ovata, cordata basi, 34–61 cm longa, 12–34 cm lata, submitida, subbullata supra; sinus plerumque hippocrepiformis; nervis basalibus 5 ad 6 utroque; nervis lateralibus 1–8 ad 13 utroque; nervis collectivis 3–5 mm a marginibus in dimidio inferiore laminae usque 1–3 mm a marginibus in dimidio superiore laminae, a nervis basalibus quintis aut sextis oriundis; pedunculus 21–42 cm longus; spatha 8–15.3 cm longa, 1.5–4 cm lata, plerumque viridis vel flavoviridis; spadix stipitatus usque 1–2 cm, 8–15 cm longus, albocanis, tum lavendulus; baccae purpureoviolaceae.

Epiphytic or terrestrial; stem short or scandent; *internodes* 1–6(10) × 0.5–3 cm, semiglossy, medium green, drying medium brown; roots few per node; *cataphylls* 11–30 cm long, persisting at bases or as short thin fibers, drying dark brown. LEAVES erect; *petioles* 33–68.5 cm × 3–9 mm (dry), terete, weakly and narrowly sulcate, sometimes obtusely flattened adaxially, semiglossy, medium green, drying light brown; geniculum swollen, paler than petiole, 1–1.5 cm long, drying slightly swollen, dark brown; *blades* subcoriaceous, ovate, abruptly acuminate at apex, deeply cordate at base, 34–61 × 12–34 cm, 1.6–2.2(2.9) times longer than wide, 0.8–1.1 times longer than petiole, broadest below middle; anterior lobe 26–48 × 12–34 cm, 2.6–3.6 times longer than posterior lobes; posterior lobes 8–14.5 × 6–17.5 cm, rounded at apex; sinus hippocrepiform or sometimes spathulate to parabolic, 5–13.5 cm deep; upper surface semiglossy to glossy, somewhat bullate, dark green, drying semiglossy and olive-green to olive-brown, lower surface glossy, paler, drying glossy and paler than above; *midrib* narrowly raised, paler above, acute and paler below, drying concolorous, acutely raised above, round-raised and darker below; *primary lateral veins* 8 to 13 per side, departing midrib at a 50 –60 angle, slightly curving to collective veins, narrowly raised in valleys, paler above and below, drying concolorous, flat above, prominently raised, darker below; *basal veins* 5 to 6 per side, 1st one free to base, 4 to 5 coalesced for 1.5–4.5 cm, posterior ribs naked to 5 cm; collective veins 3–5 mm from blade margin in lobes and lower 1/2 of blade, 1–3 mm from blade margin in upper 1/2 of blade, originating from 5th or 6th basal vein; tertiary veins reticulate, obscure to darker above, slightly raised below. INFLORESCENCES erect; *peduncle* 21–42 cm × 4–6 mm (dry), shorter than petiole, medium to light green, drying light olive-brown; *spathe* reflexed, 8–15.3 × 1.5–4 cm, tapered at apex, green to yellow-green,

sometimes white; *spadix* stipitate 1–2 cm, cylindrical, slightly tapered at apex, 8–15 cm × 7–10 mm (dry) near base, 4–5 mm diam. (dry) near apex, glossy, grayish white, becoming lavender to violet-purple. Flowers square, 2.2–2.4 × 2.4–2.5 mm; tepals papillose on surface, margins exserted; stigma 3–4 mm long, linear. INFRUCTESCENCE to 18 cm long; *berries* purplish violet, early-emergent.

The species is known only from the Bajo Calima region in the Valle Department, occurring in *Tropical wet forest* transition to *Premontane* (T-wf/P), below 150 m. It was collected in primary and regrowth forests.

Anthurium fragrans is a member of section *Calomystrium*, and is characterized by its terete, narrowly sulcate petioles, glossy, ovate-cordate, slightly bullate blades usually with a hippocrepiform sinus, and with collective veins originating from the fifth or sixth basal vein. The inflorescences have acuminate spathes and grayish white spadices, which become dark purple after anthesis. At anthesis the spadices are quite fragrant with a sweet odor similar to an Easter lily, (*Lilium longiflorum* var. *eximium* (Cortois) Baker Liliaceae) hence the name "fragrans." This species is often infected with a pathogen, which causes yellow pustules to form on the surface upon drying; any or all parts of the plant may be infected. Though this condition is not restricted to *A. fragrans*, it is more severely exhibited in *A. fragrans* than any other species observed at Bajo Calima.

The glossiness and slightly bullate appearance of the blades, which lack punctations or obvious raphides even under magnification, the hippocrepiform sinus, the spathes that are more acuminate than apiculate, and the lavender spadices distinguish this species from all other section *Calomystrium* species in the Bajo Calima region.

Croat & Bay 75723, from Bajo Calima, appears to be *Anthurium fragrans*; however, it differs slightly in having a very narrow collective vein (1–2 mm from the blade margin throughout the blade length), a C-shaped petiole, and upon drying has obvious raphides on the upper blade surface as well as a reddish brown color. It may be a hybrid between *A. fragrans* and *A. obtusilobum* Schott, also occurring in the Bajo Calima region.

Anthurium flavidum N. E. Brown, a poorly known species from an unspecified location in Colombia, is quite similar to *A. fragrans*, but differs in having blades that are punctate on the lower surface.

It was collected in February, May, July, September, and October, and in fruit in May, July, and August.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Monsalve 327* (MO), *886* (CUVC, MO), *1049* (CUVC, MO), *3067* (CUVC), *Croat & Monsalve 61391* (CUVC, MO), *Croat 62772* (CUVC, MO), *69304* (CUVC, MO); km 22, Carretera Hanz, *Croat 69485* (CUVC, MO), *61296* (MO), *61360* (COL, GH, MO, QCNE, UB, USM); km 49, *Croat & Bay 75816* (CUVC, MEXU, MO, SEL, TEX); km 50.5, *Croat & Watt 70334* (G, HUA, MO); km 51.7, *Croat & Bay 75776* (CUVC, MO); km 55.7, *Croat 70991* (CUVC, MO); Córdoba, *Killip 5107* (NY).

Anthurium hinoideum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 51.7, 16 July 1993, *T. B. Croat & D. Bay 75770* (holotype, MO-4576798; isotypes, B, COL, CUVC, K, US).

Planta terrestris, interdum epiphytica; internodia 5–30 mm longa; cataphylla 14–20 cm longa, persistentia ut fibrae pallidae a nodus superioribus; petiolus 36–108 cm longus, teres, obtuse vel anguste sulcatus adaxialiter, interdum multostriatus; lamina ovata, profunde cordata basi, 38–77 cm longa, 18.5–46 cm lata, leniter nitida vel velutina vel hebetata supra, hebetata infra; nervis basalibus 7 ad 9 utroque, 2–4 liberis ad basim; nervis lateralibus I 19 ad 37 utroque; nervis collectivis 2–5 mm a marginibus, a nervis basalibus quintis aut sextis oriundis; pedunculus 31–50 cm longus; spatha 12.5–19 cm longa, virens; spadix sessilis, 12.8–34.5 cm longus, venetus vel viridis; baccae virides (immaturae).

Terrestrial or occasionally epiphytic; stem short; *internodes* semiglossy, 5–30 × 7–30 mm, medium yellow-green, becoming light brown, drying pale tan; roots few to several per node; *cataphylls* 14–20 cm long, firm, medium green, persisting as pale fibers at upper nodes. LEAVES erect-spreading; *petioles* 36–108 cm × 5–11 mm (dry), terete, bluntly to narrowly sulcate adaxially, sometimes many-striate, matte, brittle, medium yellow-green, drying light olive-green; geniculum 1–1.5 cm long, slightly swollen, paler than petiole, drying shrivelled; *blades* subcoriaceous, ovate (juvenile blades oblong-elliptic, subcordate base), acuminate at apex, deeply cordate at base, 38–77 × 18.5–46 cm, 1.8–2.2 times longer than wide, 0.7–1.1 times longer than petiole, broadest beyond middle, upper surface weakly glossy to velvety to matte, dark green, drying semiglossy and light olive-green with numerous white raphides (visible with 10 × magnification) on both surfaces, lower surface matte, paler; anterior lobe 30–59 × 18.5–46 cm, 2.5–3.4 times longer than posterior lobes; posterior lobes 10.8–22.5 × 9.8–20.3 cm, rounded at apex; sinus spathulate to hippocrepiform, 5.5–15 cm deep; major veins drying concolorous, sunken above, paler, prominently raised below; *midrib* narrowly to acutely raised, concolorous or paler above, round-raised, paler below; basal veins 7 to 9 per side, 2 to 4 free to base, 4 to 6 coalesced to 5.5 cm, posterior ribs naked to 3.5 cm; *primary lateral veins* 19 to 37 per side, departing midrib at a 55°–65° angle, straight to collective veins, narrowly sunken

above, narrow-raised below; interprimary veins nearly equal in prominence to primary lateral veins; collective veins 2–5 mm from blade margin, originating from 5th or 6th basal vein; tertiary veins reticulate, slightly sunken above, slightly raised below. INFLORESCENCES erect to erect-spreading; *peduncle* 31–50 cm × 3–4 mm (dry), shorter than petiole, drying light olive-green; *spathe* reflexed, 12.5–19 cm long, brittle, medium green, with margins rolled under; *spadix* sessile, cylindrical, gradually tapered at apex, 12.8–34.5 cm × 4–7 mm (dry) at base, to 3 mm diam. (dry) at apex, bluish green to green. Flowers rhombic, 2.2–2.4 × 1.4–1.6 mm; thecae oval, to 0.3 × 0.3 mm; pollen white. INFRUCTESCENCE to 25 cm long; *berries* early-emergent, pointed at apex, green (immature).

Anthurium hinoideum is known from the Pacific Andean slopes of Colombia in the Departments of Chocó and Valle occurring in *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), usually from sea level to 500 m. It was collected in primary and regrowth forests.

Anthurium hinoideum is a member of section *Polyneurium* and is characterized by its ovate blades that are deeply cordate at base, numerous primary lateral and interprimary veins (hence the name "hinoideum," meaning with all primary lateral veins parallel), petioles which are equal to or nearly as long as the blades, and bluish-green spadices.

Anthurium pulverulentum Sodiro, a species occurring at higher elevations than Bajo Calima and in Ecuador differs from *A. hinoideum* in having blades where the anterior lobe is broadly convex and broadest mostly at the point of the petiole attachment, whereas *A. hinoideum* has blades that are proportionately more elongated with the anterior lobe straight or concave along its margin and usually broadest toward the apex. In addition, the internodes of *A. pulverulentum* are noticeably elongated and with longitudinal ribbing, whereas in *A. hinoideum* they are proportionately shorter and lack conspicuous longitudinal ribbing.

Anthurium hinoideum is also similar to *A. argyrostachyum* Sodiro from Ecuador, which differs in having larger and more angular basal lobes, red cataphylls, and usually occurs at high elevations (500–2300 m). *Anthurium panduriforme* Schott from Panama is also similar; however, it has orbicular basal lobes that flare outward and a golden yellow spadix.

It was collected in flower and in fruit in Valle in July and in flower in the Chocó in April.

Paratypes. COLOMBIA. **Chocó:** Medellín–Quibdó rd., 5.5 km E of Tutunendo, *Croat 56235* (CUVC, MO); Quibdó–Medellín rd., km 175.5, 21 km E of Tutunendo, *Croat 56322* (MO). **Valle:** Buenaventura–Málaga rd., *Croat 70161* (CUVC, MO); km 51.3, *Croat & Watt 70382* (CUVC, MO); km 55.7, *Croat 70992A* (CUVC, MO); along old Cali–Buenaventura rd., 1.1 km S of entrance to Queremal, 52.7 km N of Agua Clara, *Croat & Bay 75578* (CUVC, MO); El Chanco, CVC Project Calima III, *Devia 1251* (MO); vic. of Bahía Málaga, Base Naval Málaga; Río Bongito, *Croat & Gaskin 80527* (CUVC, MO), *80569* (CUVC, MO).

Anthurium holquinianum Croat & Bay, sp. nov.

TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 11, about 100 m, 4 Aug. 1993, *D. Bay 280* (holotype, MO-4601422; isotypes, CUVC, K, US).

Planta epiphytica aut terrestris; internodia 2–13 cm longa, 8–13 mm diam.; cataphylla 15–20 cm longa, persistentia intacta a nodis superioribus, persistentia ut fibrae pallidae decompositae a nodis inferioribus cum frustris epidermidis rebrobrunniae intactis apice cataphyllorum; petiolus 11–23 cm longus, acute U-formatus; geniculum cum marginibus nonnihil undulatum; lamina ovata, subcordata vel cordata basi, 20–35.5 cm longa, 11.5–21 cm lata, subnitida vel subvelutina supra, hebetata infra; nervis omnibus atropurpureobrunneis infra in sicco; nervis basalibus 3 ad 5 utroque, omnibus liberis ad basim; nervis lateralibus I 10 ad 14 utroque; nervis collectivis 4–6 mm a marginibus, a nervis basalibus primis oriundis; pedunculus 13.5–21 cm longus; spatha 6.5–14 cm longa, 10–12 mm lata, virens; spadix sessilis vel stipitatus 1–3 mm, 10–18 cm longus, cremalbus aut himnuleus aut bubalinus, tum atrolivaceus vel vinaceus in fructescentia; baccae mature emergentes, purpureae vel vinaceae.

Epiphytic or terrestrial; stem scandent or decumbent; JUVENILE plants differ in having blades, which are ovate, rounded to truncate at the base, becoming subcordate; *internodes* semiglossy, 2–13 cm × 8–13 mm, longer than wide, yellow-green to dark brown or purple-brown, drying smooth, reddish brown; roots few per node; *cataphylls* 15–20 cm long, pale to medium green, bluntly acute at apex, persisting intact at upper nodes, weathering to pale fibers with most of apical epidermis intact at lower nodes, fibers drying pale whitish with reddish brown apical epidermis and wide paler margins. LEAVES erect-spreading; *petioles* 11–23 cm × 2–4 mm (dry), sharply U-shaped with erect margins, somewhat flattened adaxially and sulcate, medium green, drying olive-brown; geniculum 1–1.5 cm long, somewhat undulate along margins, drying darker than petiole; *blades* subcoriaceous, ovate, acuminate at apex, subcordate to cordate at base, 20–35.5 × 11.5–21 cm, 1.5–2 times longer than wide, (1.2)1.5–2(2.3) times longer than petiole, broadest below middle, upper surface semiglossy to subvelvety, dark green, drying dull, dark green to gray-green or olive-brown, lower surface matte, paler, drying glossy, paler than above; major veins drying concolorous and barely raised above, dark purplish brown and prominently raised below; *midrib* acutely

raised, paler above, round-raised, paler below; *primary lateral veins* 10 to 14 per side, departing midrib at a 45 –50° angle, curving slightly to collective veins, narrowly sunken and paler above, convex and paler below; *basal veins* 3 to 5 per side, free to base; collective veins 4–6 mm from blade margin, originating from first basal vein; tertiary veins reticulate, raised below. INFLORESCENCES erect; *peduncle* 13.5–21 cm × 2–3 mm (dry), slightly longer than petiole, medium green, drying olive-brown; *spathe* spreading to reflexed, 6.5–11 cm × 10–12 mm, acuminate, medium green, drying medium brown; *spadix* sessile to stipitate 1–3 mm, cylindrical, 10–18 cm × 4–8 mm (dry), usually cream to creamy white or tan, becoming dark olive-green to wine-red in fruit. Flowers square, 1.5–2.3 × 1.3–1.8 mm; stigma oval; thecae ellipsoid, to 3 mm long. INFRUCTESCENCE to 14 cm long; *berries* early-emergent, purple to wine-red.

The species ranges along the Pacific Andean slopes of Colombia to the Province of Esmeraldas, Ecuador, occurring in *Premontane wet forest* (P-wf), *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 530 m. In the Bajo Calima region it was collected in primary and regrowth forests.

Anthurium holquinianum is a member of section *Xialophyllium* Schott, and is characterized by cataphylls that weather to pale fibers with most of the epidermis remaining intact and drying reddish brown with wide pale margins, and ovate subcordate leaf blades with free basal veins and most of the veins usually drying dark purple on the lower surface. Also distinctive are the cream-colored inflorescences, which become wine-red in fruit with reddish purple berries.

Anthurium holquinianum is easily confused with *A. multinervium* Engler, a species from the western Andes of Colombia and also occurring in the Bajo Calima region, which differs in having blades with a more deeply cordate base, 6 to 8 basal veins, several of which are coalesced to form naked posterior ribs, collective veins originating from the fifth to seventh basal vein, and a yellow spadix.

Croat & Watt 70455 from 270 m in the Valle Department (not within the Bajo Calima region), may also be this species; however it differs slightly in having somewhat more well-developed basal lobes.

Anthurium holquinianum was named in honor of Oliverio Holquin, an employee of Cartón de Colombia at Bajo Calima, who assisted our work in many ways from providing transportation to building a plant dryer.

Anthurium holquinianum was collected in flower in the Bajo Calima region in February, March, July, and August and in fruit in July and August. Other Colombian material was collected in flower in April, June, and December.

Paratypes. COLOMBIA. **Chocó:** Medellín–Quibdó rd., 78 km W of Bolívar, *Croat 49293* (MO); Quibdó–Istmina rd., 14 km S of Quibdó, *Croat 52213* (MO); km 4, *Croat & Cogollo 52236* (MO), *52237* (MO); Quibdó–Medellín rd., 25 mi. E of Quibdó, *Croat 52302* (CUVC, MO); km 175, 24 km E of Tutunendo, *Croat 56314* (CUVC, MO); Quibdó–Las Ánimas rd., 1 km N of Las Ánimas, *Croat 55951* (MO); Las Ànimas–Pato rd., Río Pato, *Croat 56173* (MO); Quibdó, near Atrato, *Mena et al. 005* (MO); Bolívar–Quibdó rd., 44.8 mi. W of Bolívar, *Croat & Cogollo 52127* (CUVC, MO); Tadó–Istmina, 3.5 km W of bridge over Río San Juan at Tadó, 5.0 km, *Croat & Gaskin 80780* (CHOCO, COL, MO). **Nariño:** Tumaco, Alto Albí, *González 136* (MO). **Valle:** Buenaventura–Málaga rd., km 9, *Croat 70119* (CUVC, MO); km 11, *Killip & Cuatrecasas 39030* (F, US); *Croat 69312* (CUVC, MO); *Monsalve 1010* (MO); *Bay 231* (CUVC, MO), *279* (CUVC, MO); km 14, *Croat 57540* (CUVC, MO); km 18, *Croat 61317* (MO); km 31.5, *Croat & Watt 70244* (CUVC, MO); vic. of Bahía Málaga, near Base Naval Málaga, along trail along the edge of the bay W of base headquarters, *Croat & Gaskin 80573* (B, MO, VEN). ECUADOR. **Esmeraldas:** 2–4 km SE of San Lorenzo, along railroad track, 10 m, *Boom 2605* (NY).

Anthurium isidroense Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 51.7, 16 July 1993, *T. B. Croat & D. Bay 75769* (holotype, MO-4576803; isotypes, B, COL, CUVC, K, US).

Planta epiphytica aut terrestris; internodia 3–4 cm longa, 1.5–3 cm diam.; cataphylla 14–36 cm longa, persistentia ut fibrae pallidae decompositae a nodis superioribus, decidua; petiolus 81–95 cm longus, 1–1.3 cm diam., teres vel subteres, obtuse sulcatus; lamina ovata vel late ovata, profunde cordata basi, 63–104.5 cm longa, 42–64 cm lata, nitida supra, subnitida infra; nervis basalibus 8 ad 9 utroque, 2 liberis ad basim; nervis lateralibus 9 ad 14 utroque; nervis collectivis 3–5 mm a marginibus, a nervis basalibus quartis aut quintis oriundis; pedunculus usque 31 cm longus; spatha 19–25 cm longa, usque 3 cm lata, pallide viridis; spadix sessilis, 16–47 cm longus, hebetatus, virens, albus, aut flavus, tum atroviolaceopurpureus; baccae virides, tum rubrae in maturite.

Epiphytic or terrestrial; stem short; *internodes* 3–4 × 1.5–3 cm; roots several per node, reddish brown; *cataphylls* 14–36 cm long, unribbed, medium green, weathering to pale fibers, persisting at upper nodes, deciduous. LEAVES erect; *petioles* 81–95 × 1–1.3 cm (dry), terete to subterete, weakly and obtusely sulcate, semiglossy, medium green, drying smooth, reddish brown; 2–4 cm long, drying darker than petiole; *blades* subcoriaceous, ovate to broadly ovate, acuminate at apex, deeply cordate at base, 63–104.5 × 42–64 cm, 1.5–3.2 times longer than wide, 0.8–1.1 times longer than petiole, upper surface glossy, dark green, drying semiglossy and olive-green

to olive-brown, lower surface semiglossy, paler, drying glossy and barely paler than above; anterior lobe 47–75 × 42–64 cm, 2.2–2.3 times longer than posterior lobes; posterior lobes 21.5–32 × 21–30 cm; sinus hippocrepiform, 12–24.5 cm deep; major veins drying concolorous to slightly darker on both sides, barely raised above, prominently raised below; *midrib* narrow-rounded, paler above and below; *primary lateral veins* 9 to 11 per side, departing midrib at a 50–60° angle, ± straight to collective veins, narrow-raised, paler above, convex, paler below; *basal veins* 8 to 9 per side, 2 free to base, 6 to 7 coalesced 9–11 cm, posterior ribs naked 9–11 cm; collective veins 3–5 mm from blade margin, originating from 4th or 5th basal veins; tertiary veins reticulate, drying raised below. INFLORESCENCES spreading-erect; *peduncle* to 31 cm long, to 5 mm diam. (dry), medium green, drying dark brown; *spathe* spreading, 19–25 cm long, to 3 cm wide, acuminate, pale green; *spadix* sessile, cylindrical, slightly tapered toward apex, 16–47 cm long, to 9 mm diam. (dry) near base, to 5 mm diam. (dry) near apex, matte, medium green, white, or yellow, becoming dark violet-purple at anthesis, often drying blackened. Flowers rhombic, 1.8–2.3 mm long, to 1.3 mm wide; thecae ellipsoid, to 3 mm long. INFRUCTESCENCE 32–69 cm long; *berries* pointed at apex, green becoming red at maturity.

The species is known only from the Bajo Calima region in *Tropical wet forest* transition to *Premontane* (T-wf/P), up to 150 m. *Anthurium isidroense* was collected in older regrowth and primary forests.

Anthurium isidroense is a member of section *Polyneurium*, characterized by large, glossy, deeply cordate blades with a hippocrepiform sinus, long terete petioles, long deciduous cataphylls, and dark violet-purple inflorescences. The species is most easily confused with *A. dolichostachyum* Sodiro, but that species differs in having the cataphylls thin and deciduous and the spathe thin and promptly deciduous. It also resembles *A. ravenii* Croat & Baker, but that species differs in having the cataphylls mostly deciduous, a cylindroid spadix with much smaller flowers, and stamens that emerge promptly throughout the entire spadix. One of the first collections was from near San Isidro, hence the species epithet.

Anthurium isidroense was collected in flower in January, March, July, and December, and in fruit in January, March, July, August, September, and December.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Monsalve 345* (CUVC), *931* (CUVC, MO), *1096* (CUVC, MO), *1695* (CUVC, MO); km 33.3, *Croat 61385* (CUVC, F, G, HUA, JAUM, MO, VEN); km 37, *Croat 69383* (CUVC); km 51.3, *71018* (MO, NY); Dindo area, *Gentry et al. 53751* (MO); near San Isidro, *Gentry 35462* (MO, NY); Palestina, 5 m, *Forero et al. 4065* (MO); vic. of Bahía Málaga, Base Naval Málaga, Río Bongito, *Croat & Gaskin 80525* (CUVC, GH, MO, NY).

Anthurium joaquinense Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 11, Pulpapel Camp, ca. 100 m, 4 July 1986, *T. B. Croat 62782* (holotype, MO-3131997; isotypes, B, COL, CUVC, K, US).

Planta plerumque terrestris, raro epiphytica; internodia brevia, 1–2.5 cm diam.; cataphylla 7–10 cm longa, persistentia ut fibrae porphyreae decompositae; petiolus (12)23–46 cm longus, teres, interdum anguste sulcatus adaxialiter, virens, interdum purpureus atroviridiguttatus; lamina oblongo-elliptica vel ovata, attenuata vel cuneata basi, (27.5)30.5–47.5(53) cm longa, 6.6–14.5(20) cm lata, hebetata in superficiebus ambabus, minute sparsimque fuscopunctata supra, minute fuscopunctata infra; nervis lateralibus I 17 ad 27 utroque; nervis collectivis I pro maxima parte 4–12 mm a marginibus, nervis collectivis II marginalibus; pedunculus 18–37(50) cm longus, virens aut purpurascens, interdum viridiguttatus; spatha 4–8.2 cm longa, 7–13 mm lata, virens; spadix sessilis, 6.3–11.5 cm longus, nitidus, virellus, tum flavus vel cremalbus sub anthesi, tum olivaceus, purpureus in fructescentia; infructescentia erecta; baccae maromminae vel purpureae.

Usually terrestrial, rarely epiphytic; stem short; *internodes* short, 1–2.5 cm diam.; *cataphylls* 7–10 cm long, weathering to reddish brown fibers, often with pieces of reddish brown epidermis attached, persistent. LEAVES erect-spreading; *petioles* (12)23–46 cm × 4–6 mm (dry), semiglossy, terete, sometimes narrowly sulcate adaxially, medium green, sometimes purple with dark green speckles, drying light olive-green; geniculum swollen, 1–2.2 cm long, drying dark brown; *blades* moderately coriaceous, oblong-elliptic to ovate, abruptly long-acuminate at apex, attenuate to cuneate at base, (27.5)30.5–47.5(53) × 6.6–14.5(20) cm, 2.4–4.5(5) times longer than wide, 0.9–1.5(2.3) times longer than petiole, broadest near middle or slightly below, upper surface matte, dark green, minutely and sparsely dark-punctate, drying dull, light olive-green or sometimes slightly yellowish green, lower surface matte, paler than above, minutely dark-punctate, drying slightly semiglossy, paler than above, sometimes yellowish green; *midrib* convex, paler than surface above, bluntly acute, paler than surface below; *primary lateral veins* 20 to 34 per side, departing midrib at a 55–60° angle, curving slightly to collective veins, weakly sunken above, raised, darker below; collective veins 4–12 mm from margin at base, tapering to 2–3 mm from margin near apex, 2nd collective vein marginal, more deeply sunken than primary lateral

veins above, prominently raised below; tertiary veins reticulate. INFLORESCENCES erect; *peduncle* 18–37(50) cm × 3–5 mm (dry), medium green or purple, sometimes green-speckled, drying olive-green or olive-brown; *spathe* erect-spreading, 4–8.2 cm × 7–13 mm, acute at apex, medium green, drying light olive-green; *spadix* sessile, cylindrical, barely tapering toward apex, 6.3–11.5 cm long, to 7 mm diam. (dry), glossy, green pre-anthesis, becoming yellow to creamy white at anthesis, becoming olive-green to purple in fruit; drying medium to dark golden brown. Flowers rhombic; stigma to 3 mm long, linear; anthers barely raised above tepals; thecae ovoid. INFRUCTESCENCES erect; *berries* obovoid, to 4 mm long, maroon to purple.

Anthurium joaquinense ranges along the Pacific Andean slopes of Colombia in the Departments of Chocó and Valle, in *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), with most collections made from below 150 m, but two collections are from 850 m and 1430 m. At Bajo Calima it has usually been collected in areas of early regrowth forests, but also occurs in older regrowth forests and occasionally in primary forest.

Anthurium joaquinense is a member of section *Porphyrochitonium*, and is characterized by oblong-elliptic to ovate blades that are matte on both surfaces, terete petioles that are narrowly sulcate, a geniculum markedly swollen and drying dark brown, and cataphylls weathering to reddish brown fibers. The glossy yellow spadix is also distinctive.

Anthurium joaquinense is quite similar to *A. marginellum* Sodiro, from elevations of about 100 m in Esmeraldas Province of Ecuador, and *A. aureum* Engler, which occurs at 1200–1700 m in the Frontino region, Antioquia Department, Colombia. Both of the latter species, however, differ in having blades that are glossy on both surfaces, and innermost collective veins that are very near the margin from base to apex. In addition, *A. marginellum* has a reddish brown spadix and spathe that apparently is reflexed at anthesis compared to an erect-spreading spathe in *A. joaquinense*; and *A. aureum* is glandular-punctate on only the lower blade surface and has pale tan cataphyll fibers that lack any persistent pieces of epidermis.

The species most easily confused with *Anthurium joaquinense* is *A. vallense* Croat, a species ranging from Panama to Colombia and also occuring in the Bajo Calima region. However, the latter species differs in having blades that are glossy on both surfaces and proportionately longer than the petioles (1.1–3.1 times for *A. vallense* compared to 0.9–1.5 times for *A. joaquinense*), petioles that are deeply sulcate with sharp erect margins, and longer cataphylls that dry paler brown.

Anthurium joaquinense is also similar to *A. magnifolium* Croat & J. Rodriguez, known only from Pichincha Province in Ecuador. These two species share similar shapes and proportions, appearing much alike especially when dry. However, the latter species differs in occurring as a trunk epiphyte, having blades that are weakly glossy below, and in having a longer spadix. When dry, the two can also be differentiated by the more profuse punctations on the upper surface of the blade of *A. magnifolium*.

Forero et al. 3959 and *Croat 71120*, both from the Bajo Calima region, have much longer, narrower blades that dry somewhat darker than all the other collections of *Anthurium joaquinense*. Another collection, *Croat 70152* (sterile), also from the Bajo Calima region, differs in having exceedingly prominulous venation upon drying. One other sterile collection, *Croat & Watt 70290*, may be *A. joaquinense*; however, the blades dry somewhat darker, and the petiole is sharply sulcate.

Several collections (*Croat 55971*, *56161*, *57394*, *57397*, and *Croat & Cogollo 52105*), all from the Chocó Department, may also be *Anthurium joaquinense*; however, they differ in drying much glossier on the lower blade surface, and having collective veins that are closer to the margin throughout the blade length.

Anthurium joaquinense is named for the Quebrada de San Joaquín, within the Bajo Calima region, where the earliest collection studied was made.

The species has been collected in flower in February, March, April, July, and September, and in fruit in February and July.

Paratypes. COLOMBIA. **Chocó:** Río Atrato, Samurindó, *Cuatrecasas & Llano 24107* (COL); San José del Palmar, Río Torito, *Forero et al. 7338* (MO); San José del Palmar-Cartago, La Bella, *Croat 56700* (CUVC, MO); Quibdó–Las Ánimas rd., ca. 1 km N of Las Ánimas, *Croat 55968* (CUVC, MO); Quibdó–Lloro rd., ca. 1 km S of ferry over Río Atrato, *Croat 55985* (CUVC, MO); Serranía de Baudó, Las Ánimas–Pato rd., Río Pato, *Croat 56091* (CUVC, MO), *56160* (CUVC, MO); Quibdó–Istmina, S of Río Rancherita, between km 31 and 32, *Croat 57365* (CUVC, MO); Quibdó–Bolívar, between km 175 and 176, Croat *57514* (CUVC, MO). **Valle:** Buenaventura–Málaga rd., km 11, *Kennedy & Andrews 1316* (SEL), *1330* (SEL), *Gentry & Juncosa 40533* (COL, MO), *Monsalve 336* (MO), *62786* (MO), *69311* (CUVC, MO); km 12.5, Croat *70152* (CUVC, MO), *70154* (CUVC, MO), *70156* (CUVC, MO); km 14, *Croat 57515* (CUVC, MO); km 22, Carretera Hanz, *Croat 69524* (CUVC, MO), *69528* (CUVC), *71120* (MO); 1 km W of Carretera Gasolina, 6 km S of Buenaventura–Málaga rd., *Croat 69410* (CUVC, MO), *69429* (CUVC, MO); Buenaventura–Málaga rd., km 50.7, *Croat & Bay 75681A* (CUVC); km 51.3, *Croat & Watt 70374* (MO); km 52.4, *Croat & Bay 75730* (CUVC, HUA, MO); km 55.7, *Croat 70993* (MO, NY); between km 65 and 66, *Croat*

710334 (CUVC); Quebrada La Sierpe, near Palestina, *Forero et al. 3959* (MO); rd. to Juanchaco Palmeras, *Gentry et al. 18033* (MO); Bahía de Buenaventura, Quebrada de San Joaquín, *Cuatrecasas 19889* (VALLE).

Anthurium langendoenii Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Dindo area, 50 m, 7 Feb. 1989, *A. Gentry, A. Martínez & L. González 65537* (holotype, MO-4064466; isotype, CUVC).

Planta epiphytica; internodia brevia, usque 2 cm diam.; radices tenues, ramosae; cataphylla 3–6 cm longa, persistentia semi-intacta ut fibrae sparsae decompositae; petiolus 1.5–15 cm longus, acute triangularis; lamina obovata, attenuata basi, 28–35.5 cm longa, 9.5–15.4 cm lata, fusco-punctata in superficiebus ambabus; nervis lateralibus 12 ad 13 utroque; nervis collectivis 3–5 mm a marginibus tenus apice; pedunculus 12–14.5 cm longus, viridis suffusus rubellus; spatha 3.3–4.8 cm longa, viridis; spadix sessilis, 3.6–4.5 cm longus, hebetatus, pallide flavoviridis vel cremeus; infructescentia 6.5–7 cm longa; baccae maronninae aut purpurascentes.

Epiphytic; stem short; *internodes* to 2 cm diam.; roots slender, branched; *cataphylls* 3–6 cm long, weathering to sparse fibers, dark reddish brown, persisting semi-intact. LEAVES erect; *petioles* 1.5–15 cm long, ca. 5 mm diam. (dry), sharply triangular, medium green; geniculum 5–8 mm long, swollen, yellowish green, drying slightly darker than petiole; *blades* subcoriaceous, obovate, abruptly short-acuminate or obtuse-apiculate at apex, attenuate at base, 28–35.5 × 9.5–15.1 cm, 2.2–2.7(3.5) times longer than wide, (1.9)3.7–5.9(6.7) times longer than petiole, broadest beyond middle, upper surface weakly glossy, dark green, dark punctate with moderately large punctations, drying semiglossy and dark brown, lower surface semiglossy, paler than above, dark punctate with moderately large punctations, drying glossy and paler than above; *midrib* convex, paler above, acutely angular, paler below, drying darker than surface on both sides; *primary lateral veins* 12 to 13 per side, departing midrib at a 45°–55° angle, straight to collective veins, sunken above, convex below, drying barely visible above, raised and darker than surface below; innermost collective veins evenly 3–5 mm from margin, meeting midrib at apex, drying equal to primary lateral veins; tertiary veins reticulate, less conspicuous than major veins. INFLORESCENCES erect; *peduncle* 12–14.5 cm × 2–4 mm (dry), longer than petiole, green tinged red, drying reddish brown; *spathe* spreading to reflexed, 3.3–4.8 cm long, obtuse-apiculate at apex, green; *spadix* sessile, cylindrical, 3.6–4.5 cm long (6.5–8 cm long in Ecuador), 4–5 mm diam. (dry), matte, pale yellow-green to cream. Flowers square, to 2 mm long and wide; tepals granular; stigma 0.2–0.3 mm long, linear. INFRUCTESCENCE erect, 6.5–7 cm × 12–20 mm (dry); *berries* maroon or purple; seeds 8 per berry.

The species is known from the Pacific coast of the Departments of Chocó and Valle, and in Colombia the Provinces of Esmeraldas and Cotopaxi, Ecuador, occurring in *Tropical wet forest* (T-wf) and *Tropical wet forest* transition to *Premontane* (T-wf/P) below 150 m in Colombia, to 250 m in the Province of Esmeraldas, and up to 750 m in the Province of Cotopaxi.

Anthurium langendoenii is a member of section *Porphyrochitonium*, and is characterized by obovate blades with 12 to 13 distinct primary lateral veins, drying dark brown, petioles that are short and sharply triangular, and small pale yellow-green spadices with purple berries.

Anthurium langendoenii is somewhat similar to *A. quinquesulcatum* Sodiro, from Ecuador, which differs in having petioles with five ribs. Material from the Province of Cotopaxi, Ecuador, differs slightly in having blades that are acuminate rather than short acuminate or obtuse-apiculate, *MacDougal & Betancur 1100* and *Betancur et al. 895*, specimens representing some unknown species, both collected near Amalfi in the Antioquia Department, are remarkably similar to *A. langendoenii*. They differ, however, in having elliptic blades that are widest near the middle or below, long petioles (to 29 cm long), and very long peduncles (up to 48 cm long).

Anthurium langendoenii is named in honor of Donald Faber-Langendoen, who collected the species in the Bajo Calima region, and also conducted research on the effects of the methods of lumber extraction employed by Cartón de Colombia at Bajo Calima.

In the Bajo Calima region it was collected in areas of regrowth forests in flower in February, and in fruit in February and April.

Paratypes. COLOMBIA. **Chocó:** Río Mecana, about 10 km E of Mecana, *Gentry & Juncosa 11091* (COL, MO). **Valle:** Buenaventura Málaga rd., km 11, *Gentry & Juncosa 10528* (MO); km 22, Carretera Hanz, *Croat 71095* (CUVC, MO); km 37, *Croat & Gaskin 79787* (CUVC, MO); km 40, *Croat 701654* (MO); km 41, *Croat & Watt 70180* (MO); Dindo, *Gentry et al. 56756* (MO). ECUADOR. **Cotopaxi:** Tenefuerste, Río Pilalo, km 52–53, Quevedo, Latacunga, *Dodson & Gentry 12796* (MO, SEL); *Dodson & Gentry 12923* (MO). **Esmeraldas:** San Lorenzo, Res. Etnica Awá, Alto Tambo, Río Mira, *Iulestia & Iulestia 1235* (MO).

Anthurium lautum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 49, 17 July 1993, *T. B. Croat & D. Bay 75815* (holotype, MO-0573811; isotypes, CUVC, K, US).

Planta terrestris aut epiphytica; internodia brevia, 6–30 mm diam.; cataphylla usque 7 cm longa, persistentia semi-intacta a nodis superioribus, ut fibrae tenuae decompositae a nodis inferioribus; petiolus 15.5–47.5 cm longus, teres vel subteres, interdum obtuse complanatus, anguste sulcatus adaxialiter; lamina ovata, profunde cordata basi, 27–69 cm longa, 11.5–35 cm lata, nitida, bullata supra, subnitida infra; nervis basalibus 6 ad 8 utroque, 1 ad 2 liberis ad basim; nervis lateralibus 1 7 ad 9 utroque; nervis collectivis 2–3 mm a marginibus, a nervis basalibus primus oriundis; pedunculus usque 3 cm longus; spatha usque 8 cm longa, pallide viridis; spadix sessilis, usque 10.5 cm longus, hebetatus, cremalbus; infructescentia ignota.

Terrestrial or epiphytic; juvenile plants similar to adults; adult stems short, scandent; *internodes* 6–30 mm diam., semiglossy, dark green; *cataphylls* to 7 cm long, persisting semi-intact at upper nodes, weathering to thin fibers at lower nodes, drying light reddish brown. LEAVES erect; *petioles* 15.5–47.5 cm × 2–4 mm (dry), terete to subterete, sometimes obtusely flattened and narrowly sulcate adaxially, semiglossy, medium green, firm, flexible, drying pale green; geniculum swollen, 1–2 cm long; *blades* subcoriaceous, ovate, acuminate at apex, deeply cordate at base, 27–69 × 11.5–35 cm, 1.9–2.3 times longer than wide, 1.1–1.7 times longer than petiole, broadest near middle, upper surface glossy to semiglossy, somewhat bullate, dark green, drying semiglossy, medium green, lower surface semiglossy, paler, drying glossy, paler than above; anterior lobe 30–48 × 11.5–35 cm, 2.2–2.6 times longer than posterior lobes; posterior lobes 11.5–21.5 × 10–17 cm, rounded at apex; sinus hippocrepiform, 7–21 cm deep; major veins drying concolorous, slightly raised above, pale yellow to white, prominently raised below; *midrib* narrowly convex, paler both sides; *primary lateral veins* 7 to 9 per side, 2–3.5 cm apart, departing midrib at a 50°–70° angle, curving to collective veins, deeply sunken above, narrowly raised below; *basal veins* 6 to 8, 1 to 2 free to base, 5 to 7 coalesced for 2–9 cm, posterior ribs naked 1.5–7 cm; collective veins 2–3 mm from blade margin, originating at first basal vein; tertiary veins prominent below. INFLORESCENCES erect; *peduncle* to 3 cm long, shorter than petiole; *spathe* spreading-reflexed, to 8 cm long, pale green; *spadix* sessile, cylindrical, to 10.5 cm × 3–4 mm (dry), matte, creamy white. Flowers square, 1.4–1.5 × 1.2–1.5 mm. INFRUCTESCENCE unknown.

The species is known only from the Bajo Calima region of Colombia in the Valle Department, occurring in *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to about 100 m; collected only in primary forest.

Anthurium lautum is a member of section *Polyneurium*, and is characterized by slender petioles, ovate blades that are deeply cordate at the base appearing somewhat quilted or puckered above, glossy and green both in life and when dry, with the collective veins originating from the first basal vein, few primary lateral veins that are rather far apart, and a hippocrepiform sinus. The species is closest in appearance in dried condition to *A. angamarcanum* Sodiro, but that species differs in having a velvety matte blade upper surface and often with the areas along the major veins on the upper surface paler than the remainder of the surface. The latter species is known principally from Ecuador, but probably also occurs in the same region as Bajo Calima at higher elevations on the eastern slope of the Cordillera Occidental near the Continental Divide on the Cali to Buenaventura highway at km 18. See *Croat & Gaskin 79947*.

Two sterile collections representing unknown species, *Croat 50178* from Estación Microondas Tokio in the Valle Department, and *Croat & Cogollo 52177* from 6.6 km S of Quibdó in the Chocó Department, are similar to *Anthurium lautum*, but both of the former plants differ in having somewhat wider, rounder blades that dried quite flat (therefore, may not have been puckered in life), and in having more primary lateral veins. These two collections also differ in having nearly all of basal veins joining the collective veins, a character shared with *Croat 55983* from the Chocó Department, and *Croat 61335A* from the Bajo Calima region. The latter two collections do not differ in any other way from *A. lautum*. Another collection from the Valle Department, close to Queremal (*Croat & Bay 75579*), is also quite similar to *A. lautum*, but differs in having blades that are velvety above (noticeably different under 10 × magnification), and a spadix reported as green and drying dark brownish black.

The glossy deep green blades inspired the specific epithet *lautum*, meaning appearing freshly washed or elegant.

Anthurium lautum has been collected in flower in July.

Paratypes. COLOMBIA. **Chocó:** Along road between Quibdó and Lloró, ca. 5 km S of ferry crossing over Río Atrato, 5°29″N, 76°35′W, 150 m, *Croat* 55983 (MO).**Valle:** Buenaventura–Málaga rd., km 22, Carretera Hanz, *Croat 71064* (CUVC, MO); km 40, *Croat 70163* (CUVC, MO); km 50.5, *Croat & Watt 70335* (MO); Bahía Málaga, vic. Base Naval Málaga, along rd. to Buenaventura, ca. 1 km from base ca. km 104, *Croat & Gaskin 80465* (B, CUVC, MO); Bajo Calima, 6.3 km N of Frente La Brea, km 18 on main road, ca. 6 km SE of village of San Isidro on Río Calima; ca. 50 m, 40°02′N, 77°03′W, 7 July, 1986, *Croat* 61335A.

Anthurium lygrum R. E. Schultes ex Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 35.2, 100 m, 15 July 1993, *T. B. Croat & D. Bay 75753* (holotype, MO-4573853; isotypes, B, COL, CUVC, K, NY, US).

Planta epiphytica; internodia brevia, usque 1 cm diam.; radices crassae; cataphylla 6–7.5 cm longa, persistentia non nisi a nodis superioribus ut fibrae tenuae pallidae decompositiae; petiolus 11–26 cm longus, acute sulcatus adaxialiter, acute 3-costatus abaxialiter; lamina anguste oblongo-elliptica, acuta basi, 37–50 cm longa, 5–7.5 cm lata, nitida in superficiebus ambabus; nervis lateralibus 10 ad 12 utroque; nervis collectivis 2–8 mm a marginibus, a basi oriundis; pedunculus 14.5–28.5 cm longus, acute vel obscure 5-alatus; spatha 4–8 cm longa, viridis; spadix stipitatus 2–3 mm, 7.8–13 cm longus, hebetatus, atroviridis; baccae globosae vel ellipsoideae, 3.8–4 mm longae, virides.

Epiphytic; stem short; *internodes* short, to 1 cm diam.; roots 2 to 3 per node, stout, drying pale tan; *cataphylls* 6–7.5 cm long, weathering to scant, thin, pale fibers, persisting only at upper nodes. LEAVES erect-spreading; *petioles* 11–26 cm × 2–3 mm (dry), sharply sulcate with erect margins adaxially, sharply 3-ribbed abaxially, glossy; geniculum 5–8 mm long, drying concolorous; *blades* subcoriaceous, oblong-narrow elliptic, long-acuminate at apex, acute at base, 37–50 × 5–7.5 cm, 6–7.2(8.3) times longer than wide, 1.7–4.2 times longer than petiole, broadest near middle, upper surface glossy, blackish green, drying dull, medium green, lower surface weakly glossy, slightly paler, drying semiglossy, paler; major veins drying concolorous, barely raised above, paler, yellowish, round-raised below; *midrib* narrow-raised, concolorous above, acute, slightly paler below; *primary lateral veins* 10 to 12 per side, departing midrib at a 40°–60° angle, straight or curving to collective veins, sunken above, narrow-raised below; collective veins 2–8 mm from blade margin, originating at base; tertiary veins reticulate, obscure above, raised below. INFLORESCENCES erect; *peduncle* 14.5–28.5 cm × 1–2 mm (dry), longer than petiole, sharply to obscurely 5-winged, drying medium green; *spathe* reflexed, 4–8 cm long, green, acuminate; *spadix* stipitate 2–3 mm, 7.8–13 cm × 2–4 mm (dry), cylindrical, matte, dark green. Flowers rhombic, 1.8–2 × 1.3–1.5 mm; stigma round, to 0.2 mm wide. INFRUCTESCENCE with *berries* early-emergent; globose to ellipsoid, 3.8–4 mm long, green.

The species is known only from the Bajo Calima region in Valle, Colombia, in *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 150 m. It was collected in primary and older regrowth forests.

Anthurium lygrum is a member of section *Polyneurium*, and is characterized by slender petioles, peduncles that are 5-ribbed, dark green, glossy, oblong-narrow elliptic blades with few primary lateral veins, and dark green spadices.

Anthurium albertiae, also occurring in the Bajo Calima region, is similar to *A. lygrum* but differs in having blades that are often ovate-narrow elliptic, only sometimes oblong-narrow elliptic, and broadly to narrowly rounded at the base, many primary lateral veins (25 to 33, in contrast to 10 to 12 in *A. lygrum*), and subterete petioles that are sulcate adaxially.

The specific epithet *lygrum* means harmful (probably only when consumed), and was suggested by Schultes on the label of *Schultes & Villarreal 7391*.

Anthurium lygrum was collected in flower and in fruit in February, March, May, and July.

Paratypes. COLOMBIA. **Valle:** Buenaventura Málaga rd., km 11, *Albert de Escobar et al. 4008* (HUA); Quebrada La Brea, *Schultes & Villarreal 7391* (US); 18 km E of Buenaventura, *Killip & García 33249* (US); Bahía Málaga, vic. Base Naval Málaga, along rd. to Buenaventura, ca. 1 km from base ca. km 104, *Croat & Gaskin 80478* (CUVC, MO).

Anthurium malagaense Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima, Buenaventura–Málaga rd., km 11, 9 July 1986, *T. B. Croat & M. Monsalve 61410* (holotype, MO-3490647; isotypes, CUVC, US).

Planta epiphytica aut terrestris; internodia brevia, 1–2 cm diam.; radices paucae, tenues; cataphylla 7–10 cm longa, persistentia semi-intacta; petiolus 28.5–46 cm longus, acute C- vel U-formatus, sulcatus, interdum inconspicue 1-costatus; lamina ovata, late rotundata basi, 36–44 cm longa, 14–17.5 cm lata, subnitida vel hebetata in superficiebus ambabus, brunneopunctata infra; nervis lateralibus I 14 ad 18 utroque; nervis interlateralibus paene tam prominentibus quam nervis lateralibus I; nervis collectivis I 10–15 mm a marginibus basi, 3–5 mm a marginibus apice, nervis collectivis II marginalibus; pedunculus 28–51.5 cm longus; spatha plus quam 9–12 cm longa, pallide viridis vel viridis; spadix stipitatus usque 2 mm, 17–30 cm longus, cremeoviridis vel viridis; baccae virides.

Epiphytic or terrestrial; stem short; *internodes* 1–2 cm diam.; roots few, slender; *cataphylls* 7–10 cm long, persisting semi-intact, drying reddish brown. LEAVES erect-spreading; *petioles* 28.5–46 cm × 4–5 mm (dry), sharply C- to U-shaped, sulcate, sometimes with faint medial rib adaxially, medium green, drying dark olive-green; geniculum 1–1.5 cm long, slightly swollen, paler than petiole, drying darker than petiole; *blades* coriaceous, ovate, acuminate at apex, broadly rounded at base, 36–44 × 14–17.5 cm, 2.1–2.8 times longer than wide, 0.8–1.4 times longer than petiole, broadest near middle, upper surface weakly glossy to matte, dark green, drying dull, olive-green, lower surface weakly glossy to matte, brown-punctate, paler than above,

drying semiglossy, paler; *midrib* convex, slightly paler above, convex to acutely convex, paler below; *primary lateral veins* 14 to 18 per side, departing midrib at a 55 – 65° angle, weakly sunken above, raised below, drying concolorous on both sides, barely raised above, prominently raised below; interprimary veins nearly as prominent as primary lateral veins; collective veins 10–15 mm from blade margin at base, 6–7 mm from blade margin midway, 3–5 mm from blade margin at apex, second collective vein forming close to blade margin near base; tertiary veins reticulate, obscure both sides. INFLORESCENCES erect; *peduncle* 28–51.5 cm × 3–5 mm (dry), shorter or longer than petiole, drying olive-green to brown; *spathe* spreading to reflexed, 9–12+ cm long (all were broken off), pale green to green; *spadix* stipitate to 2 mm, cylindrical, 17–30 cm × 3–4 mm (dry), creamy green to green. Flowers rhombic, 2.5–2.6 × 1.1–1.4 mm. INFRUCTESCENCE with *berries* early-emergent; berries green (immature).

The species is known only from the Bajo Calima region in Valle, Colombia, occurring in *Tropical wet forest* transition to *Premontane* (T-wf/P) below 150 m.

Anthurium malagaense is a member of section *Porphyrochitonium* and is characterized by ovate blades usually matte on both sides and punctate on the lower surface, petioles nearly as long as the blades, and inflorescences, spathe, and spadix green.

Anthurium malagaense can be confused with *A. verrucosum* and *A. wattii*; both are common in the Bajo Calima region. Both of the latter species differ from *A. malagaense* in having elliptic to ovate-elliptic blades several times longer than wide [(3.3–4.9(5.6), in contrast to 2.1–2.8 times longer than wide for *A. malagaense*], and usually longer than the petioles, and that dry glossy to semiglossy rather than matte. In addition, the latter species have spadices that are some shade of gray, yellow, or tan (except *A. wattii*, which often has a green spadix that becomes dark purple as the berries begin to emerge) and red to dark purple berries.

Anthurium malagaense is named for the Bahía Málaga, of the Pacific Ocean, which is surrounded by the Bajo Calima region.

Anthurium malagaense was collected in flower in February and July, and in fruit in February.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Croat 57560* (CUVC, MO); km 18, *Croat 61316* (K, MO); km 51.3, *Croat & Watt 70375* (CUVC, MO).

Anthurium monticola Engler var. **attenuatum** Croat & Bay, var. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 9, 3 Feb. 1990, *T. B. Croat 70122* (holotype, MO-3784810; isotypes, B, COL, CUVC, F, K, NY, PMA, US).

Haec varietas differt a varietate typica lamina angustiore, late rotundata et abrupte attenuata basi; spadice saepe aliquantum longiore.

Epiphytic or terrestrial; stem short; *internodes* to 2 cm × 1.5–3 mm, green to gray-green; roots several per node; *cataphylls* 8–9 cm long, mostly deciduous, with a few pale cataphyll fibers persisting at upper nodes. LEAVES erect; *petioles* 19.5–45(49) cm × 3–4 mm (dry), subterete, obtusely flattened adaxially, narrowly sulcate, medium green, drying olive-green to olive-brown; geniculum 5–10 mm long, swollen, paler than petiole, drying dark brown; *blades* moderately coriaceous, ovate, abruptly long-acuminate at apex, broadly rounded and abruptly attenuate at base, 19.5–39.5 × 9–20 cm, (1.7)2–2.9 times longer than wide, 0.7–1.5(1.8) times longer than petiole, upper surface semiglossy or rarely matte, dark green, drying semiglossy, olive-green to olive-brown, lower surface weakly glossy, paler, drying glossy, paler than above; major veins drying concolorous, barely raised above, darker than surface, often reddish brown, prominently raised below; *midrib* convex, slightly raised above, prominently raised, paler below; basal veins 3 to 4 per side, free to base; *primary lateral veins* 7 to 12 per side, departing midrib at a 35°–55° angle, curving gradually to collective veins, narrowly sunken above, convex below; collective veins 5–9 mm from blade margin, loop-connecting at primary lateral veins, originating from first basal vein; tertiary veins reticulate, moderately obscure above, slightly raised below. INFLORESCENCES erect; *peduncle* 7.5–22 cm long, shorter than petiole, terete, medium green to greenish brown, drying olive-brown; *spathe* reflexed, 4.5–11 cm long, acuminate, medium green, often tinged with purple or maroon; *spadix* sessile or stipitate to 5 mm long, cylindrical, blunt at apex, 5.5–16 cm × 4–5 mm (dry), glossy, dark purple. Flowers rhombic to square, 2.8–3.2 × 1.7–2.5 mm; tepals slightly exserted; *pistils* strongly exserted. INFRUCTESCENCES erect, 6.5–16 cm long, often sterile in distal 1/3 to 1/2; *berries* early-emergent, narrowly ovate to oblong-ellipsoid, 1.2–1.7 mm long, about 8 mm diam., green becoming red.

Anthurium monticola ranges along the Pacific slopes of Colombia (Chocó and Valle) to Esmeraldas Province of Ecuador, in Tropical wet forest (T-wf), Premontane wet forest (P-wf), and Tropical wet forest transition to Premontane (T-rf/P), from sea level to 1200 m. The species is a member of section *Polyneurium* and has two varieties, both of which occur together at Bajo Calima. The variety *attenuatum* is newly described here. The variety *attenuatum* ranges along the Pacific Andean slopes of Colombia in the Departments of Chocó, Nariño, and Valle

occurring in *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 600 m. In the Bajo Calima region it was collected in primary and regrowth forests.

Anthurium monticola var. *attenuatum* is characterized by ovate (pear-shaped) blades that are broadly rounded and abruptly attenuate (hence the epithet *attenuatum*) at the base, basal veins free to the base, slender petioles, deciduous cataphylls, and dark purple inflorescences borne on short peduncles. Also distinctive are the flowers with exserted tepals, strongly exserted pistils, and early-emergent green berries.

Variety *attenuatum* differs from *Anthurium monticola* var. *monticola* in having blades that are narrower, (1.7)2–2.9 times longer than wide compared to 1.2–1.8 times longer than wide in variety *monticola*, broadly rounded and abruptly attenuate at the base (compared to sub-cordate), and spadices that are often somewhat longer.

Anthurium monticola var. *attenuatum* was collected in flower and in fruit every month of the year in the Bajo Calima region, individual plants often bearing both an inflorescence and infructescence at the same time.

Paratypes. COLOMBIA. **Chocó:** Yuto–Lloro rd., *Gentry & Fallen 17835* (MO); Nóvita, N of Cerro Torrá, Camino al Alto del Oso, *Forero et al. 3197* (MO); Río Atrato, Loma del Sapo Bocas del Guayabal, *Forero et al. 9437* (MO); Quibdó–Guayabal, *Moreno et al. 12* (MO); Quibdó–Lloro rd., ca. 1 km S of ferry over Río Atrato, *Croat 55978* (CUVC, MO); Quibdó–Yuto rd., 12 km S of Quibdó, *Croat 56256* (CUVC, MO). **Nariño:** Barbacoas, 15 km above the Río Telembi, *Hammel & Bernal 15782* (MO). **Valle:** Buenaventura - Málaga rd., km 11, *Kennedy & Andrews 1317* (SEL), *1336* (SEL), *Gentry et al. 40408* (MO), *Gentry & Juncosa 40531* (MO), *Monsalve 230* (CUVC, MO), *317* (CUVC, MO), *690* (MO), *889* (MO), *896* (MO), *1154* (CUVC), *van der Werff & Monsalve 9692* (MO), *Croat & Monsalve 61402A* (MO), *Croat 62787* (CUVC, MO), *69301* (CUVC, MO), *Bay 217* (CUVC, MO), *225* (CUVC, MO); km 11.5, *Croat & Gaskin 79775* (CUVC, MO); km 14, *Croat 57511* (CUVC, MO); km 17.5, *Croat & Bay 75644* (CUVC, MO), *Croat 61319* (MO, QCNE, USM); km 37, *Croat 69384* (CUVC, MO); km 51.7, *Croat & Bay 75786A* (CUVC, G, GH, MO, USM); Dindo, *Gentry 35645* (MO); San Isidro, *Gentry 35605* (MO); La Trojita, *Cuatrecasas 16267* (VALLE), *16548* (VALLE), *16861K* (VALLE); Córdoba, *Pittier 586* (US), *Killip 5108* (NY, US), *11803A* (GH), *Killip & García 33323* (US), *33456A* (US), *Cuatrecasas 19851* (F); Quebrada La Brea, *Schultes & Villarreal 7389* (US); El Tambo, *Cuatrecasas 21019* (F); Anchicayá, *Koie 494* (C); Río Cajambre, *Cuatrecasas 17430* (VALLE).

Anthurium oxyanthum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., vic. of km 50.7, about 50 m, 12 July 1993, *T. B. Croat & D. Bay 75673* (holotype, MO-4572424; isotypes, B, COL, CUVC, F, K, NY, PMA, QCNE, US).

Planta epiphytica; internodia brevia, 1–3 cm diam.; radices ramosae; cataphylla 5–7 cm longa, persistentia aliquantum intacta ut reticulum decompositum; petiolus 15–28 (33) cm longus, triangularis, interdum sulcatus, 1-costatus adaxialiter; lamina elliptica, acuta vel obtusa basi, 27–35 (38) cm longa, 8–15(21) cm lata, subnitida in superficiebus ambabus, fuscopunctata infra; nervis lateralibus I 20 ad 25 utroque; nervis collectivis I 3–10 mm a marginibus, interdum nervis collectivis II in 1/5 parte inferiore laminae; pedunculus 22–43 cm longus, virens, interdum suffusus ruber; spatha 5–8 cm longa, virens, interdum aliquantum rubella; spadix sessilis, 22–30 cm longus, nitidus, virens, raro flavoviridis vel cremeus; infructescentia 22–24 cm longa, maronnina aut aurantiaca; baccae clare rubrae.

Epiphytic; stem short; *internodes* 1–3 cm diam.; roots branched; *cataphylls* 5–7 cm long, weathering to a reddish brown net-like reticulum, persisting somewhat intact. LEAVES erect to erect-spreading; *petioles* 15–28(33) cm × 3–6 mm (dry), triangular, sometimes somewhat sulcate adaxially, sometimes with a medial rib adaxially, medium green; geniculum 1–1.5 cm long, drying darker than petiole; *blades* moderately coriaceous, elliptic, acuminate to obtuse-apiculate at apex, acute to obtuse at base, 27–35(38) × 8–15(21) cm, (1.8)2.2–3.5(3.7) times longer than wide, 1–1.5(1.7) times longer than petiole, upper surface usually semiglossy, sometimes glossy, lacking punctations, dark green, sometimes tinged reddish, drying semiglossy, olive-green, sometimes medium brown, lower surface semiglossy, dark brown-punctate, paler than above, drying glossy, medium brown, sometimes slightly reddish brown; *midrib* convex and paler than surface above, sharply acute and paler than surface below, drying concolorous and raised on both sides; *primary lateral veins* 20 to 25 per side, departing midrib at a 55–65° angle, straight to innermost collective veins, weakly sunken above, convex, darker below, drying barely visible above, raised below; collective veins 3–10 mm from margin, sometimes a second collective vein present in basal 1/5 of blade; tertiary veins reticulate. INFLORESCENCES erect; *peduncle* 22–43 cm × 3–7 mm (dry), usually longer than petiole, medium green, sometimes slightly reddish, drying reddish brown or olive-green; *spathe* stiffly spreading, 5–8 cm long, coriaceous, medium green, sometimes slightly reddish, inrolled; *spadix* sessile, long-tapered, 22–30 cm × 8–11 mm (dry) at base, 1–3 mm diam. (dry) at apex, glossy, medium green, rarely yellow-green to cream, drying dark brown. Flowers rhombic; tepals granular, dark green, semiglossy, lateral tepals overlapping at preanthesis, inner margin of tepals acutely curved upward (dry); *pistils* early and strongly exserted, pale

green; stamens emerging above tepals; thecae obovoid, acute at apex of each pair. INFRUCTESCENCE 22–24 cm long, usually maroon, rarely reddish-orange; *berries* bright red, globose to ovoid, usually sparsely scattered in basal 1/3 of spadix.

The species ranges along the Pacific coast of Colombia in the Departments of Chocó and Valle, in *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), from sea level to 150 m. In the Bajo Calima region it was collected in primary forest and regrowth forests.

Anthurium oxyanthum is a member of section *Porphyrochitonium*, and is easily distinguished by its elliptic leaf blades, sharply triangular petioles, and stiffly spreading spathe. The long-tapered spadix with sharply exserted pistils, tepals, and anthers is especially characteristic, giving it a "prickly" appearance, hence the name "oxyanthum" meaning having pointed flowers.

The species is similar to three other species, *A. malagaense*, *A. Verrucosum*, and *A. wattii*, in having blades less than three times longer than the petioles and glandular-punctate only on the upper surface. It differs from all of these by having petioles triangular in cross section and in having prominently protruding pistils.

Albert de Escobar & Folsom 4031, from the Bajo Calima region, is a mixed collection having a leaf that is probably *Rhodospatha oblongata* Poeppig and an inflorescence of *Anthurium oxyanthum*.

Anthurium oxyanthum was collected in flower in the Bajo Calima region in January, February, March, April, June, July, and August, and in fruit in June and July. One collection from the Chocó Department was in flower in November.

Paratypes. COLOMBIA. Chocó: Quibdó–Lloro rd., about 1 km S of ferry over Río Atrato, *Croat 55986* (MO); Tutunendo–Icho rd., N of Tutunendo, *Juncosa 1185* (MO). **Valle:** Buenaventura–Málaga rd., km 11, *Albert de Escobar & Folsom 4031* (HUA), *Bay 215* (CUVC, MO), *Gentry et al. 40407* (COL, MO), *Gentry & Juncosa 40528A* (MO), *Gentry et al. 53875* (MO), *Kennedy 781* (F), *Killip & Cuatrecasas 39024* (US), *39166* (US), *Monsalve 190* (CUVC, MO), *191* (MO), *239* (MO), *1667* (MO), *3162* (CUVC), *Croat 69330* (CUVC, MO); km 14, *Croat 57535* (CUVC, MO); km 22, Carretera Hanz, *Croat 69497* (CUVC, MO), *71083* (MO), *71125* (MO); km 33.3, *Croat 61298* (CUVC, G, GH, HUA, JAUM, MO, VEN); km 40, *Croat 70165* (MO); Dindo area, *Gentry 48421* (CUVC, MO); rd. to Juanchaco Palmeras, *Gentry et al. 48003A* (MO), *48028* (CUVC), *Gentry et al. 48029* (MO); San Isidro, *Devia & Prado 2869* (TULV); La Trojita, *Cuatrecasas 16479* (VALLE); Bajo Calima, *Croat 69758* (MO); mouth of Río Naya to mouth of Río Yurumanqui, *Gentry & Juncosa 40703* (MO).

Anthurium perviride Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., 4.5 km W of km 28, 3 Aug. 1993, *D. Bay 249* (holotype, MO4585216; isotypes, CUVC, K, US).

Planta epiphytica; internodia brevia, usque 1.5 cm diam.; cataphylla 5–10 cm longa, persistentia semi-intacta ut reticulum fibrorum decompositorum; petiolus 14.5 27 cm longus, acute C-formatus, sulcatus, pallide viridis; lamina ovato-elliptica, attenuata vel obtusa basi, 22.5–33 cm longa, 8.3–14.5 cm lata, velutina vel subnitida, minute sparsimque fuscopunctata supra, subnitida, minute fuscopunctata, verrucosa, saepe pustulata infra; nervis lateralibus I 14 ad 16 utroque; nervis intralateralibus paene tam prominentibus quam nervis lateralibus I; nervis collectivis 7–9 mm a marginibus; pedunculus 20.5–51 cm longus, pallide viridis, aliquantum angularis; spatha 6.5–12 cm longa, viridis, interdum suffusa rubella vel flavida; spadix sessilis, 13.5–20.3 cm longus, viridis, tum flavus vel aureus; infructescentia ignota.

Epiphytic; stem short; *internodes* to 1.5 cm diam.; *cataphylls* 5–10 cm long, persisting semi-intact, reddish brown, weathering to a net-like reticulum of fibers. LEAVES erect to spreading; *petioles* 14.5–27 cm × 3–4 mm (dry), sharply C-shaped, sulcate adaxially, pale green, drying light olive-green; geniculum 1–1.5 cm long, drying slightly darker than petiole; *blades* coriaceous, ovate-elliptic, acuminate at apex, attenuate to obtuse at base, 22.5–33 × 8.3–14.5 cm, 2.2–3 times longer than wide, 1.2–1.9 times longer than petiole, upper surface velvety to semiglossy, dark green, minutely and sparsely dark brown punctate, sometimes obscurely punctate, drying dull, light olive-green, lower surface semiglossy, paler than above, minutely dark brown-punctate, finely verrucose and often with larger pustules, drying semiglossy, pale green; *midrib* convex, paler above, sharply acute, paler below; *primary lateral veins* 14 to 16 per side, departing midrib at a 40°–50° angle, slightly curving out to collective veins, weakly to narrowly sunken above, convex to narrowly raised below, drying concolorous both sides, raised below; interprimary veins almost as prominent as primary lateral veins, drying with a stitched appearance below; collective veins 2, rarely 1 pairs 7–9 mm from blade margin; tertiary veins reticulate. INFLORESCENCES erect; *peduncle* 20.5–51 cm × 3–4 mm (dry), longer than petiole, pale green, somewhat angular, drying light tan; *spathe* spreading to reflexed, 6.5–12 cm long, green, sometimes tinged reddish or yellowish, acuminate; *spadix* sessile, gradually tapering, 13.5–20.3 cm × 6–7 mm (dry) at base, 2–3 mm diam. (dry) at apex, green becoming yellow to orange-yellow, drying light golden brown. Flowers rhombic, 3.3–4.0 × 2.0–3.2 mm; stigma oval to round; thecae ellipsoid, widely divaricate, barely emergent above tepals. INFRUCTESCENCE not seen.

The species is known only from the Bajo Calima region, in *Tropical wet forest* transition to *Premontane*

(T-wf/P), up to 150 m. In the Bajo Calima region it was collected from primary and older regrowth forests.

Anthurium perviride is a member of section *Porphyrochitonium*, and is characterized by cataphylls that persist in a net-like reticulum of reddish brown fiber and ovate-elliptic blades that are deep green, almost velvety on the upper surface (hence the name "perviride" meaning intensely green and dark-punctate on both sides). Also distinctive are the long, tapered, bright yellow spadices.

The species is somewhat similar to *Anthurium joaquinense*, which differs in having longer petioles, blades that are matte on both surfaces, and spadices that are short and cylindrical (i.e., not tapering).

Anthurium perviride is also similar to *A. sagaeae* Croat, from Panama at 800 m, which differs in having a triangular petiole and spadices that are cylindrical (not tapering) and are dark brown upon drying.

Anthurium perviride was collected in flower in July, August, and November.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Monsalve 910* (CUVC, MO); km 33.3, *Croat 61302* (MO).

Anthurium phyllobaris Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 17.5, 11 July 1993, *T. B. Croat & D. Bay 75831* (holotype, MO-4579217; isotypes, B, CUVC, US).

Planta epiphytica, interdum terrestris; internodia usque 4 cm longa, 2–4 cm diam., hebetata; cataphylla 4.5–16 cm longa, persistentia intacta in nodis superioribus, ut fibrae decompositae in nodis inferioribus, denique decidua; petiolus 28.5–57 cm longus, subteres vel D-formatus, anguste complanatus adaxialiter, interdum anguste sulcatus; lamina ovata, ovata-elliptica, vel rarius ovata-triangularis, cordata basi, 35–60 cm longa, 14.5–32 cm lata, hebetata in superficiebus ambabus; nervis basalibus 5 ad 7 utroque, 3 liberis ad basim; nervis lateralibus 15 ad 16 utroque; nervis collectivis 4–5 mm a marginibus, a nervis basalibus quintis aut sextis oriundis; pedunculus 11–20 cm longus, olivaceus, interdum suffusus purpureus; spatha 8–9 cm longa, viridis, suffusa purpurea cum nervis atropurpureis; spadix sessilis, 10.5–15.8 cm longus, flavoviridis vel olivaceus vel violaceo-purpureus; infructescentia ignota.

Epiphytic or occasionally terrestrial; stem short; *internodes* to 4 cm long, 2–4 cm diam., matte, medium green, drying light gray; roots few per node, 2–4 mm diam. (dry), drying dark brown; *cataphylls* 4.5–16 cm long, thick, drying light gray, persisting ± intact at upper nodes, becoming fibrous below, finally deciduous. LEAVES erect-spreading; *petioles* 28.5–57 cm × 5–9 mm (dry), subterete to D-shaped, narrowly flattened adaxially, sometimes narrowly sulcate, matte, olive-gray to pale gray-green, drying light olive-green to olive-tan; geniculum swollen, slightly scurfy, 1–2 cm long, drying concolorous; *blades* subcoriaceous, ovate to ovate-elliptic rarely ovate-triangular, acuminate at apex, deeply cordate at base, 35–60 × 14.5–32 cm, 1.7–2.4(3) times longer than wide, 0.7–1.2(1.9) times longer than petiole, upper surface matte, rarely velvety, with profuse druse crystals (under 40× magnification) on both sides, dark green, drying dull, pale olive-green to pale olive-brown, lower surface matte, paler than above, drying dull, slightly paler than above; anterior lobe 31–46 × 14.5–32 cm, 2.8–4.2(5.2) times longer than posterior lobes; posterior lobes 6–16.5 × 6–15.2 cm, rounded at apex; sinus spathulate to obovate, 4.3–13.5 cm deep; *midrib* acutely raised and concolorous above, convex to round-raised and paler below, drying concolorous, prominently raised on both sides; *primary lateral veins* 15 to 16 per side, departing midrib at a 35–45° angle, gradually curving to collective veins, weakly and narrowly sunken above, narrowly and prominently raised below, drying concolorous and barely raised above, paler to white and round-raised below; *basal veins* 5 to 7 per side, 3 free to base, the rest coalesced for 1–3 cm, not naked to barely naked 1–1.5 cm; collective veins 1 to 2 pairs, 4–5 mm from blade margin, originating from lower 5th or 6th basal veins; tertiary veins reticulate, obscure above, darker and raised below. INFLORESCENCES erect; *peduncle* 11–20 cm × 3–4 mm (dry), shorter than petiole, olive-green, sometimes tinged purple, drying pale yellowish tan; *spathe* reflexed, 8–9 cm long, brittle, inrolled along margins, green tinged purple with darker veins; *spadix* sessile, cylindrical, semiglossy, 10.5–15.8 cm × 5–7 mm (dry), yellow-green to olive-green, violet-purple (post-anthesis), drying green to golden tan. Flowers rhombic, 2.5–2.8 × 2.4–2.7 mm; tepals glossy; *pistils* weakly emergent; thecae ellipsoid, 0.4–0.5 mm long; pollen pale yellow. INFRUCTESCENCE unknown. JUVENILE plants differ in having elliptic-ovate blades, rounded at base, becoming cordulate.

The species is known only from the Bajo Calima region, in *Tropical wet forest* transition to *Premontane* (T-wf/P), up to 150 m. In the Bajo Calima region it was collected from primary and older regrowth forests.

Anthurium phyllobaris is a member of section *Belolonchium* Schott emend. Engler, and is characterized by grayish, matte stems and petioles, dark green, ovate, matte blades with numerous druse crystals on both sides (visible under 40× magnification), deciduous cataphylls, and the short-pedunculate, olive-green, glossy spadices. The specific epithet refers to the blade that is shaped like the bottom of a rowboat ("phyllo" meaning leaf and "baris" meaning a flat-bottomed boat).

Anthurium phyllobaris is most easily confused with *A. panamense* Croat, which also occurs in the Bajo Calima region. That species differs in having weakly ridged petioles, and blades lacking obvious druse crystals and widest well below the middle, with well-developed, naked posterior ribs.

Anthurium phyllobaris was collected in flower in February, March, and July.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Gentry & Juncosa 40527* (MO); km 18, *Croat 61321* (COL, CUVC, HUA, K, MO, NY); km 22, Carretera Hanz, *Croat 71112* (MO); km 33.3, *Croat 61293A* (MO); km 37, *Croat 69381* (CUVC), *69382* (CUVC, MO); km 44, *Croat & Watt 70233* (MO, JAUM); 6 km S of Buenaventura–Málaga rd. on Carretera Gasolina, then 1 km W, *Croat 69421* (CUVC, MO).

Anthurium remotum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 22, Carretera Hanz, less than 100 m, 1 Mar. 1990, *T. B. Croat 71082* (holotype, MO-3780463; isotypes, CUVC, US).

Planta epiphytica; internodia brevia, 5–14 mm diam.; cataphylla usque 9 cm longa, persistentia ut fibrae pallidae flavalbae decompositae; petiolus 14–35 cm longus, subteres, obtuse et anguste complanatus adaxialiter; lamina ovata, late obtusa ad basim, 26–35.5 cm longa, 11.5–19 cm lata, permitida in sicco; nervis basalibus 3 ad 4 utroque; nervis lateralibus 1 7 ad 8 utroque; nervis collectivis 1 a nervis basalibus primis oriundis, usque 6 cm a marginibus, nervis collectivis 2 a nervis basalibus secundus oriundis, nervis collectivis 3 a nervis basalibus tertius oriundis; pedunculus 17.5–22.5 cm longus; spatha 4–5.3 cm longa, 1.3–1.8 mm lata, virens; spadix stipitatus 6–7 mm, 3.5–4.4 cm longus, atroviridis; baccae rubrae.

Epiphytic; stem short; *internodes* 5–14 mm diam.; *cataphylls* to 9 cm long, persisting at upper nodes as pale yellowish white fibers. LEAVES erect; *petioles* 14–35 cm long, moderately glossy, subterete, obtusely and narrowly flattened adaxially, drying pale olive-green; *blades* moderately coriaceous, ovate, elongate-acuminate at apex, broadly obtuse at base, 26–35.5 × 11.5–19 cm, 1.8–2.2 times longer than wide, 1–1.1(1.8) times longer than petiole, upper surface weakly glossy, dark green, conspicuously bicolorous, drying glossy, light olive-green, almost silvery or platinum, lower surface semiglossy, paler, drying glossy, paler than above; major veins drying concolorous, prominently raised on both surfaces; *midrib* bluntly acute, concolorous above, round-raised and paler below; *primary lateral veins* 7 to 8 per side, departing midrib at a 35°–50° angle, curving to inner collective vein, often joining reticulate veins, scarcely visible above, darker than surface and flat below; *basal veins* sunken above, 3 to 4 per side; inner collective veins originating from the first basal vein, up to 6 cm from blade margin at widest point, 2.5 cm from blade margin near middle, about 1 cm from blade margin near apex, second and third collective veins originating from each of the other basal veins, joining the blade margin about halfway; tertiary veins sometimes darker than surface above. INFLORESCENCES erect; *peduncle* 17.5–22.5 cm × 2–3 mm (dry), drying pale olive-green; *spathe* reflexed, 4–5.3 cm × 1.3–1.8 mm, acuminate, medium green; *spadix* stipitate 6–7 mm, bluntly cylindrical, 3.5–4.4 cm × 5–7 mm (dry), semiglossy, dark green. Flowers rhombic, 1–1.7 × 0.9–1.4 mm; tepals strongly exserted; thecae oval, 0.4 × 0.4 mm. INFRUCTESCENCES with red berries.

The species is known only from the Bajo Calima region, in *Tropical wet forest* transition to *Premontane* (T-wf/P), below 150 m; it was collected in areas of older regrowth forests.

Anthurium remotum belongs to section *Xialophyllium* and is characterized by thick ovate leaf blades that are broadly rounded at the base and dry very glossy on the lower surface, by the subterete petioles, and particularly by several collective veins that are quite remote from the leaf blade margin and from each other (hence the name, "remotum" meaning distant). Also distinctive are the short, blunt, dark green, long-stipitate inflorescences.

Anthurium coclense Croat is similar to *A. remotum*, but differs in having thinner blades, widest beyond the middle, narrower near the base, and never having collective veins so remote from the blade margin. In addition, it has more primary lateral veins, no basal veins, and is a darker green upon drying.

Monsalve 887, from the Bajo Calima region, is very similar to *Anthurium remotum*, but differs in having longer narrower blades. It remains undetermined.

Anthurium remotum was collected in flower in January and March, and in fruit in January.

Paratype. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Monsalve 2057* (CUVC, MO).

Anthurium rubrivellus Croat & Bay, sp. nov. TYPE: Colombia. Valle: Bajo Calima region, Buenaventura–Málaga rd., km 35.2, 100 m, 15 July 1993, *T. B. Croat & D. Bay 75754* (holotype, MO-4573852; isotypes, B, COL, CUVC, F, K, NY, PMA, QCNE, US).

Planta epiphytica vel raro terrestris; internodia 1–4 cm longa, 1.5–4 cm lata, interdum 2–3-porcata; cataphylla 9–29 cm longa, intacta a nodis superioribus, persistentia ut fibrae pallidae grossae decompositae a nodis inferioribus; petiolus (34)47–80 cm longus, 5–12 mm diam., acute C-formatus, subcomplanatus adaxialiter, cum 2-costatis tenuis; geniculum 2 3 cm longum; lamina triangulari-ovata vel

ovata, profunde cordata basi, 13–80.5 cm longa, 14–46 cm lata, nitida supra, hebetata infra; nervis basalibus 7 ad 10 utroque, 2 ad 3 liberis ad basim; nervis lateralibus 1 22 ad 26 utroque; nervis collectivis 1–5 mm a marginibus, a nervis basalibus quartus aut quintus oriundis; pedunculus 13–44 cm longus; spatha 14–33.5 cm longa, viridis vel flavoviridis, suffusa purpurea; spadix sessilis, 14–38.5 cm longus, albus, tum purpureoruber; infructescentia usque 54 cm longa; baccae rubrae.

Epiphytic or rarely terrestrial; stem appressed-climbing; *internodes* 1–4 × 1.5–4 cm, unridged or sometimes 2- to 3-ridged; *cataphylls* 9–29 cm long, weakly glossy, olive-green, intact at upper nodes, weathering to pale fibers, persisting as coarse pale tan fibers at lower nodes. LEAVES erect-spreading to spreading; *petioles* (34)47–80 cm × 5–12 mm (dry), sharply C-shaped, somewhat flattened adaxially with 2 slender ribs, brittle, matte, medium green, drying olive-green to olive-brown; geniculum swollen, 2–3 cm long, drying concolorous; *blades* triangular-ovate to ovate, acuminate at apex, deeply cordate at base, 13–80.5 × 14–46 cm, 1.6–2.6(3.1) times longer than wide, 0.9–1.3 times longer than petiole, broadest near middle or slightly beyond, sometimes below middle; upper surface semiglossy to glossy, dark green, drying dull, pale green to pale olive-brown, lower surface matte, paler than above, drying dull to barely semiglossy, slightly paler than above; anterior lobe 33.5–64 × 14–46 cm, 2.6–3.1(4.8) times longer than posterior lobes; posterior lobes 11–23 × 10–21 cm, rounded at apex; sinus obovate to hippocrepiform, 11–18 cm deep; major veins drying concolorous, barely raised above, prominently round-raised and white to yellow below; *midrib* bluntly to sharply acute or convex and paler above, round-raised to convex and paler below; *primary lateral veins* 22 to 26 per side, departing midrib at a 55–65° angle, ± straight to collective veins, weakly raised in valleys above, narrow-raised below; *basal veins* 7 to 10 per side, 2 to 3 free to base, 5 to 7 coalesced to 6 cm, naked to 6 cm; collective veins 4–5 mm from blade margin, originating from fourth or fifth basal vein; tertiary veins reticulate, sunken above, raised below. INFLORESCENCES erect-spreading; *peduncle* 13–44 cm × 5–7 mm (dry), shorter than petiole, medium green; *spathe* reflexed to spreading, 14–33.5 cm long, brittle, matte, margins and sometimes apex inrolled, green to yellow-green, tinged purple; *spadix* sessile, cylindrical, barely tapered at apex, 14–38.5 cm × 5–6 mm near base (dry), 7–13 mm diam. near apex (dry), slightly glossy, white at anthesis, becoming purplish red. Flowers rhombic, 1.6–2.1 × 1.2–1.5 mm; tepals strongly exserted in fruit; *pistils* early-emergent; stigma oval, 0.1–0.2 mm long; thecae ellipsoid, to 0.2 mm long. INFRUCTESCENCE to 54 cm long, violet-purple; *berries* red, to 1.8 mm long.

The species ranges along the Pacific coast of Colombia in the Departments of Chocó and Valle, occurring in *Tropical wet forest* (T-wf), and *Tropical wet forest* transition to *Premontane* (T-wf/P), below 150 m; it was collected from primary and regrowth forests.

Anthurium rubrivellus is a member of section *Polyneurium*, and is characterized by large triangular-ovate blades that are glossy above and matte below, long cataphylls persisting intact at the upper nodes then weathering to coarse pale fibers, and petioles that are sharply sulcate and about as long as the blades. The long inflorescences are also distinctive, having white spadices at anthesis that become violet-purple, with red berries at maturity. The small flowers with strongly exserted tepals that surround each berry give the infructescence a chenille-like appearance; the specific epithet *rubrivellus*, meaning deep red wool, refers to this.

The species is somewhat similar to *Anthurium panamense* Croat, commonly occurring in Panama and known from the Colombian Chocó Department, which differs in having deciduous cataphylls, petioles with many ridges, blades that are widest well below the middle and punctate on the lower surface, and fewer basal and primary lateral veins per side.

Monsalve 1105, from the Bajo Calima region, differs slightly in having somewhat smaller blades; however, it is probably this species.

Anthurium rubrivellus was collected in flower and in fruit in the Bajo Calima region only in July. Another collection from the Chocó Department was in flower in March.

Paratypes. COLOMBIA. **Chocó:** Río Iró, about 10 km S of Istmina, *Croat 57383* (CUVC, MO). **Valle:** Buenaventura–Málaga rd., km 11, *Bay 222* (CUVC, MO), *Croat & Monsalve 61403* (CUVC, MO), *Croat 62779* (CUVC, MO), *69345* (CUVC, MO); km 12.5, *Croat 70134* (MO); km 14, *Croat 57538* (CUVC, MO), *57555* (CUVC, MO); km 22, Carretera Hanz, *Croat 71124* (CUVC, MO); km 33.3, *Croat 61293* (G, GH, HUA, JAUM, MO, UB, VEN); km 51.3, *Croat & Watt 70372* (MO); 6 km S of Buenaventura–Málaga rd. on Carretera Gasolina, then 1 km W, *Croat 69425* (CUVC, MO); Juanchaco Palmeras, *Gentry et al. 18030* (CUVC, MO); Río Calima, near San Isidro, *Gentry 35602* (COL, MO); Cali-Buenaventura rd., near Sabaletas, *Croat 38572* (MO).

Anthurium verrucosum Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 52.4, *T. B. Croat & D. Bay 75731* (holotype, MO-4577754; isotypes B, CAS, COL, CUVC, F, GH, K, NY, M, UB, US).

Planta epiphytica aut terrestris; internodia brevia, 1–2.5 cm diam.; radices 1–3 mm diam., ramosae; cataphylla 1.5–15 cm longa, persistentia ut fibrae decompositae, saepe ut reticulum; petiolus 9–38 cm longus, acute C-formatus ver

subteres, interdum inconspicue 1-costatus; lamina oblongo-elliptica vel elliptica, plerumque obtusa, interdum cuneata basi, 24–57 cm longa, 5–19 cm lata, subnitida, profuse verrucosa, interdum sparsim pustulata supra, minute sparsimque fuscopunctata, interdum cum pustulis fasciculatis infra; nervis lateralibus I 13 ad 18 utroque; nervis interlateralibus paene tam prominentibus quam nervis lateralibus I; nervis collectivis I 3–6(2.5) cm a marginibus, saepe nervis collectivis II in 1/4–1/3 parte inferiore laminae; pedunculus 19–54 cm longus, pallide viridis, interdum ruber; spatha 5–15 cm longa, nitida, virens, interdum suffusa rubella aut flavida; spadix sessilis, 9.2–26.5 cm longus, plerumque hebetatus, griseus, grisalbus, griseoviridis, flavus, cremeoflavus, flavoviridis, aut hinnuleus; infructescentia 22–30.5 cm longa; baccae rubrae vel rubraurantiacae.

Epiphytic or terrestrial; stem short; *internodes* 1–2.5 cm diam.; roots 1–3 mm diam., branched; *cataphylls* 4.5–15 cm long, persisting as weathered fibers, often in a net-like reticulum with apical epidermis intact, drying reddish brown to light tan. LEAVES erect to erect-spreading; *petioles* 9–38 cm × 3–6 mm (dry); sharply C-shaped to subterete, sharply to obtusely flattened adaxially, often narrowly to obtusely sulcate, sometimes with a faint medial rib, semiglossy, medium green, drying olive-green; geniculum to 1 cm long, swollen, drying darker than petiole; *blades* moderately coriaceous, oblong-elliptic to elliptic, long acuminate at apex, usually obtuse or sometimes cuneate at base, 24–57 × 5–19 cm, (2.7)3.3–4.5(5.4) times longer than wide, 1–2.4(2.9) times longer than petiole, broadest near middle, upper surface semiglossy, dark green, evenly and profusely verrucose (with 10 × magnification), sometimes with sparse pustules, drying dull, dark olive-brown to brown, lower surface weakly glossy, paler than above, minutely and sparsely dark-punctate, sometimes with clustered pustules, drying glossy and reddish brown; *midrib* convex to narrowly convex, paler to concolorous above, narrowly rounded to acute, paler than surface below; *primary lateral veins* 13 to 18 per side, departing midrib at a 50°–60° angle, slightly curving to innermost collective veins, sunken, drying concolorous and barely raised above, weakly raised, drying prominently raised and darker than surface below; interprimary veins nearly as prominent as primary lateral veins; collective veins 1 to 2 pairs, 3–6 mm from blade margin, on broadest blades as much as 2.5 cm from blade margin in lower 1/4 of blade, a second collective vein often forming in lower 1/4–1/3 of blade; tertiary veins drying raised below. INFLORESCENCES erect to spreading; *peduncle* 19–54 cm × 3–6 mm (dry), longer than petiole, terete, medium to pale green, sometimes reddish, drying dark reddish brown; *spathe* spreading to reflexed, 5–15 cm long, glossy, medium green, occasionally tinged red or yellow, lanceolate; *spadix* sessile, cylindrical, slightly tapering toward apex, 9.2–26.5 cm × 3–7 mm (dry) at base, 2–5 mm diam. (dry) at apex, weakly glossy to matte, gray, grayish white, gray-green, yellow, creamy yellow, yellowish green, or tan. Flowers rhombic, 2.5–3 × 1.8–2 mm; tepals granular on the surface; stigma 2–3 mm long, oval; thecae ellipsoid, weakly emergent. INFRUCTESCENCE erect, 22–30.5 cm long; *berries* globose, red to red-orange.

The species is known from the Pacific coast of Colombia in the Departments of Chocó, Nariño, and Valle, and Esmeraldas Province in Ecuador, in *Tropical wet forest* (T-wf), and *Tropical wet forest transition to Premontane* (T-wf/P), usually at elevations below 150 m, occasionally up to 940 m. In the Bajo Calima region it was collected in primary and regrowth forests, and in coastal thickets.

Anthurium verrucosum is a member of section *Porphyrochitonium*, and is characterized by long cataphylls persisting in a net-like reticulum of fibers, moderately coriaceous elliptic blades that are profusely verrucose (under 10 × magnification) on the upper surface (hence the epithet *verrucosum*, meaning warty), and sparsely dark-punctate on the lower surface, drying dark olive-brown to brown, and having interprimary veins and reticulate veins that are nearly as prominent as the primary lateral veins upon drying. Also distinctive are the cylindrical, slightly tapering spadices, which are usually shades of gray, yellow, or tan, and the infructescences with globose red to red-orange berries.

Anthurium verrucosum is quite similar to *A. wattii*, also known in the Bajo Calima region, but *A. wattii* differs in having cataphylls that weather to semi-organized fibers (rather than in a net-like reticulum), blades that are granular on the upper surface and usually obtuse at the base, interprimary veins that are only weakly raised below, and infructescences with burgundy to purplish red berries.

Another similar species is *Anthurium fragrantissimum* Croat, known from Panama and the Pacific slopes of Colombia, which differs from *A. verrucosum* in having blades that are usually longer and narrower, with more primary lateral veins departing from the midrib at a more acute angle (about 35° compared to 50°–60° for *A. verrucosum*), and a green spadix.

Anthurium verrucosum was collected in flower in February, March, and July, and in fruit in January, February, May, June, July, August, and October.

Paratypes. COLOMBIA. **Chocó:** Río Mutata, Alto de Buey-mouth of river, *Gentry & Fallen* 17322 (MO); Trail from Tutunendo–Quibdó rd. to Tubadó, 14 km NE of Quibdó, *Gentry & Rentería 24503A* (MO); Mecana, *Juncosa 1933* (MO); Quibdó–Las Ánimas, 1 km N of Las Ánimas, *Croat 55971* (CUVC, MO); Quibdó–Lloro rd., 1 km S of ferry over Río Atrato, *Croat 56013* (CUVC, MO), *56020* (CUVC, MO); Serranía de Baudó, Las Ánimas–Pato, Río Pato, 4 km SW of

Pato on property of Sr. Guttiérez, *Croat 56162* (CUVC, MO); Las Ánimas–Pato rd., *Croat 56172* (CUVC, MO); Quibdó–Yuto rd., 12 km S of Quibdó, *Croat 56260* (CUVC, MO); Quibdó–Bolívar rd., km 175–176, 117–118 km E of Quibdó, *Croat 57507* (CUVC, MO). **Nariño:** Junín–Barbacoas rd., 18.1 km NE of Junín, *Croat 72152* (CUVC, MO). **Valle:** Buenaventura–Málaga rd., km 11, *Kennedy 755* (F), *Kennedy & Andrews 1338* (SEL), *Gentry et al. 40410A* (MO), *Gentry & Juncosa 40505* (COL, MO), *40529* (COL); km 12.5, *Croat 70155* (CUVC, MO); km 22, Carretera Hanz, *Croat 69529* (CUVC, MO), *69543* (CUVC, MO), *71131* (CUVC, MO); 4.5 km W of km 28, *Bay 250* (CAS, CHOCO, CUVC, F, MO); km 40, *Croat 70171* (CUVC, MO); km 42–43, *Croat & Watt 70291* (COL, HUA, JAUM, MO); km 49, *Croat & Bay 75820* (CUVC, MO), *75826* (CUVC, MO), *75827* (CUVC, G, HUA, JAUM, MO), *75828* (CUVC, MO); km 50.5, *Croat & Watt 70314* (CUVC, MO), *70336* (MO); km 50.7, *Croat & Bay 75677* (CUVC, MO), *75680* (CUVC, MO), *75681* (CUVC, MO); km 51.3, *Croat & Watt 70377* (CUVC, MO); km 51.7, *Croat & Bay 75764* (CUVC, MO, VEN); km 51.7, 16 July 1993, *Croat & Bay 75793*, (CUVC, MO); km 65–66, *Croat 71048* (CUVC, MO); Dindo, *Murphy & Mazuera 566* (COL), *Gentry & Monsalve 48449* (MO); Juanchaco Palmeras, *Gentry et al. 48028* (MO); Córdoba, *Killip 11803* (NY); Buenaventura, coastal thickets, *Killip 11724* (NY), *11713* (NY); Buenaventura Bay, mangrove swamp, *Killip 34981* (US); Río San Juan, near Palestina, *Cuatrecasas 21349* (VALLE). ECUADOR. **Esmeraldas:** San Lorenzo Canton, Reserva Etnica Awá, *C. Valestia et al. 282* (MO).

Anthurium wattii Croat & Bay, sp. nov. TYPE: Colombia. Valle: Buenaventura–Málaga rd., km 51.3, *T. B. Croat & J. Watt 70373* (holotype, MO; isotypes, B, COL, CUVC, F, GH, HUA, K, M, TULV, NY, S, US, USB, VEN).

Planta epiphytica, interdum terrestris; internodia brevia, 1–3 cm lata; cataphylla 4–15 cm longa, ut fibrae decompositae, persistentia semi-intacta ut fibrae decompositae; petiolus 18–36(45) cm longus, acute C- vel U-formatus, plerumque inconspicue 1-costatus, virens, interdum suffusus purpureus; lamina ovata-elliptica, elliptica vel oblanceolata, plerumque attenuata, raro obtusa basi, 30.5–55(64) cm longa, 7–14(17) cm lata, leniter nitida, raro hebetata, subtiliter granularis supra, leniter nitida, interdum hebetata, minute sparsimque fuscopunctata infra; nervis lateralibus 1 20 ad 25 utroque; nervis collectivis I 5–10 mm a marginibus basi, 2–4 mm a marginibus apice, nervis collectivis II propinque basim; pedunculus 16.5–39(58) cm longus, virens, raro suffusus purpureus; spatha 8–14.5 cm longa, viridis; spadix sessilis, 17–25(33) cm longus, plerumque virens, raro viridiflavus, viridalbus, griseoviridis, pallide aurantiacus, aut pallide ochraceus, tum atropurpureus in fructescentia; infructescentia 22–27.5 cm longa; baccae vinaceae vel purpureorubrae.

Epiphytic or occasionally terrestrial; stem short; *internodes* 1–3 cm wide; *cataphylls* 4–15 cm long, weathering to semi-organized fibers, reddish brown, persisting semi-intact. LEAVES erect-spreading to spreading; *petioles* 18–36(45) cm × 3–5 mm (dry), sharply C- to U-shaped, flattened adaxially with erect margins, broadly to narrowly sulcate, usually with a faint medial rib, weakly glossy to matte, usually medium green, rarely tinged with purple, drying dark olive-green to brown; geniculum 1–1.5 cm long, swollen, usually lighter, sometimes darker, drying thicker and darker than petiole; *blades* moderately coriaceous, ovate-elliptic to elliptic or oblanceolate, long-acuminate at apex, attenuate or rarely slightly obtuse at base, 30.5–55(64) × 7–14(17) cm, 3.4–4.9(5.6) times longer than wide, (1.3)1.5–2.6 times longer than petiole, broadest near middle, upper surface weakly glossy or semiglossy, rarely matte, dark green, finely granular (with 10 × magnification), drying dull olive-green to light olive-brown, lower surface weakly glossy, sometimes matte, paler than above, rarely yellow-green, with minute, sparse, dark punctations, often somewhat obscure, drying semi-glossy, paler; *midrib* convex, usually paler, sometimes concolorous above, acute or narrowly rounded, paler below; *primary lateral veins* 20 to 25 per side, departing midrib at a 45–55° angle, ± straight to collective veins, narrowly sunken above, raised below, drying obscure above, prominently raised below; interprimary veins usually weakly raised below; collective veins 5–10 mm from blade margin at base, 2–4 mm from blade margin at apex; second collective vein sometimes forming close to base of blade; tertiary veins reticulate, drying barely raised. INFLORESCENCES erect; *peduncle* 16.5–39(58) cm × 3–5 mm (dry), longer than petiole, medium green, rarely tinged purple, drying usually olive-green to brown; *spathe* erect-spreading to reflexed, 8–14.5 cm long, weakly glossy, green; *spadix* sessile, cylindrical, slightly tapering, 17–25(33) cm × 4–6 mm near base (dry), 3–4 mm diam. near apex (dry), weakly glossy, usually medium to dark green, rarely greenish yellow, greenish white, gray-green, pale orange, or pale golden brown (cultivated spadix), becoming dark purple in fruit. Flowers rhombic, 2.5–3.8 × 1.1–1.8 mm; surface of tepals finely granular; *pistils* weakly emergent; stigma oval; thecae ovoid, widely divaricate, 3–3.5 mm long; pollen white to golden yellow. INFRUCTESCENCE spreading, 22–27.5 cm long; *berries* burgundy to purplish red.

The species is known only from the Bajo Calima region in Valle, Colombia, in *Tropical wet forest* transition to *Premontane* (T-rf/P), below 150 m. It was collected in areas of primary or older regrowth forests.

Anthurium wattii is a member of section *Porphyrochitonium*, and is characterized by long cataphylls that persist as semi-organized reddish brown fibers, ovate-elliptic blades that are usually attenuate at the base, granular on the upper surface (with 10 × magnification), dark-punctate on the lower surface, drying olive-green to light brown, having interprimary veins less prominent than the primary lateral veins.

and having tertiary veins barely raised upon drying. In addition, the dark purple infructescence with burgundy berries is distinctive.

Cuatrecasas 17266B, from the Río Cajambre, Valle Department, Colombia, may be this species; however, it is in poor condition and the infructescence appears to have rather orange berries (dry). The collection information states only that it was epiphytic. A sterile, undetermined collection from Esmeraldas Province, Ecuador, (*Croat 72316*) may be *A. wattii*.

Anthurium wattii is quite similar to *A. verrucosum*, which differs in having cataphylls that weather to a net-like reticulum of fibers, blades that are profusely verrucose on the upper surface and usually attenuate at the base (compared to usually obtuse at the base in *A. wattii*), more prominent interprimary lateral veins, and infructescences with red to red-orange berries (compared to dark purple berries in *A. wattii*).

Another similar species is *Anthurium fragrantissimum* Croat, known from Panama and the Pacific Andean slopes of Colombia. It differs from *A. wattii* in having blades that are not profusely verrucose on the upper surface, usually longer and narrower, with more primary lateral veins departing from the midrib at a more acute angle (about 35° compared to 45°–55° for *A. verrucosum*), and red berries.

An undetermined specimen, *Forero et al. 3880*, from the banks of Quebrada La Sierpe near Palestina, may also be this species; however, it differs in drying quite dark green, and having blades that are rather thin and very smooth on the upper surface (with 10 × magnification), with many short white raphides.

Anthurium wattii is named in honor of horticulturist Jonathan Watt, formerly of the Missouri Botanical Garden, who assisted Tom Croat on a collection expedition in 1990 when many specimens of this species were collected.

Anthurium wattii was collected in flower in February and July, and in fruit in February, April, and July.

Paratypes. COLOMBIA. **Valle:** Buenaventura–Málaga rd., km 11, *Croat 69450* (CUVC, MO); km 12.5, *Croat 70153* (CUVC, MO); km 22, *Croat 69456* (CUVC, MO), *69482* (CUVC, MO), *69508* (CUVC, MO), *69531* (CUVC, MO); 1 km W of Carretera Gasolina, 6 km S of Buenaventura–Málaga rd., *Croat 69430* (CUVC, MO); km 31.5, *Croat & Watt 70238* (CUVC, MO), *70279* (MO); km 40, *Croat 70164* (CUVC, MO); km 50.5, *Croat & Watt 70332* (CUVC, MO), *70333* (CUVC, MO), *70337* (B, HUA, JAUM, MO, NY), *Croat 71011* (MO, NY); km 51.3, *Croat & Watt 70371* (CUVC, MO), *Croat 71011* (MO, NY); km 52.4, *Croat & Bay 75729* (CUVC, MO, NY, UB), *70995* (MO, QCNE); km 55.7, 27 Feb. 1990, *Croat 70992* (COL, CUVC, K, MO, US); Juanchaco Palmeras, *Gentry 48031* (CUVC, MO), *Gentry 57096* (CUVC, MO); Bajo Calima, *Gentry et al. 53877* (MO); Bahía Málaga, vic. Base Naval Málaga, along rd. to Buenaventura, ca. 1 km from base, ca. km 104, *Croat & Gaskin 80466* (CUVC, MO), *80468* (CUVC, F, MO), *80477* (CUVC, MO), *80479* (CUVC, MO), *80480* (CUVC, F, G, GH, MO, USM, VEN); vic. of Bahía Málaga, near Base Naval Málaga, along trail along the edge of the bay W of base headquarters, *Croat & Gaskin 80572* (MO, VEN), *80593* (CUVC, MO), *80594* (AAU, MO, G, GH, QCNE, TEX, UB, USM).

Anthurium wintersii Croat & Bay, sp. nov. TYPE: Colombia. Valle: Calima, region about 40 km from Pacific Ocean, 100 m, *H. F. Winters 9890* (holotype, US).

Caulis ignota; petiolus 11.5 cm longus, 2.5 mm diam.; lamina anguste-elliptica, 16.3 cm longa, 6.3 cm lata; nervis primariis lateralibus 9 ad 10 utroque; pedunculus 15.5 cm longus; spatha 4.7 cm longa, 6 mm lata; spadix viridis, sessilis, 5.5 cm longus.

Stem unknown, but presumably short with short internodes. *Petioles* 11.5 cm long, drying grayish brown, 2.5 mm diam., minutely ribbed (under magnification) with the ribs intermittent, weakly and obtusely sulcate adaxially; *blade* narrowly elliptic, 16.3 cm long, 6.3 cm wide, 2.5 times longer than wide, 1.4 times longer than petioles, weakly acuminate at apex, narrowly acute at base, drying medium gray-green and matte above, medium yellowish brown and weakly glossy below; margin drying in part closely undulate; *midrib* drying narrowly raised to acute and slightly darker above, narrowly raised, yellowish brown and ± concolorous, weakly ribbed below, sometimes acute toward the apex; *primary lateral veins* 9 to 10 pairs, arising from midrib at 35°–40° angle, scarcely more prominent than the interprimary veins, drying undulate and paler above, undulate and darker below, slightly darker than surface; collective veins, single pair arising from near the base, weakly loop-connecting the primary lateral veins and ca. 2 mm from the margins, about as prominent as the primary lateral veins; minor veins weakly raised; upper surface eglandular, lower surface minutely dark-speckled with gland-like dots 0.25 mm wide. INFLORESCENCE erect; *peduncle* 15.5 cm long, drying ca. 2 mm diam., *spathe* 4.7 cm long, 6 mm wide, spreading-reflexed, drying reddish brown, acuminate; *spadix* green, sessile, 5.5 cm long, drying 4 mm wide. Flowers rhombic, 1.4–1.8 mm long, 1.4–1.6 mm wide, 4 to 6 visible per spiral; lateral tepals 0.8–1.0 mm wide, conspicuously granular on surface, broadly rounded on inner margin, 2- to obscurely 3-sided on outer margin.

Anthurium wintersii is known only from the type specimen made at Calima, a small village on the Río Calima on the eastern edge of the study area at 100 m elevation. It occurs in *Tropical wet forest* transition to *Premontane* (T-wf/P), in regrowth forests.

The species is characterized by its small stature, small, elliptic, brownish-drying, weakly dark-speckled blades and apparent lack of glands typical of section *Porphyrochitonium*. It is a member of section *Calomystrium*.

Owing to its blade shape and relatively short petioles, the species resembles members of *Anthurium* sect. *Porphyrochitonium*, but the gland-like structures it has on the lower blade surface are easily removed, not deeply imbedded as those of section *Porphyrochitonium* (and apparently too regular and too frequent to be insect-caused). The species is most similar to *A. guayaquilense* Engler, which differs in having blades that dry somewhat blackened and are much longer, mostly more than 3.5 times longer than wide. Both *A. antioquiense* and *A. antrophyoides* differ in having 3 to 4 pairs of collective veins on either side, versus with only a single pair of collective veins for *A. icintersii*.

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Literature Cited

Croat, T. B. 1983. A revision of the genus *Anthurium* (Araceae) of Mexico and Central America. Part 1: Mexico and Middle America. Ann. Missouri Bot. Gard. 70: 211–417.

———. 1986. A revision of the genus *Anthurium* (Araceae) of Mexico and Central America. Part 2: Panama. Monogr. Syst. Bot. Missouri Bot. Gard. 14: 1–204.

——— & G. S. Bunting. 1979. Standardization of *Anthurium* descriptions. Aroideana 2: 15–25.

Gentry, A. H. 1982. Phytogeographic patterns as evidence for a Chocó refuge. Pp. 112–136 *in* G. T. Prance (editor), Biological Diversification in the Tropics. Columbia Univ. Press, New York.

Holdridge, L. R. 1967. Life Zone Ecology. Tropical Science Center, San José, Costa Rica.

———, W. H. Hatheway, T. Liang & J. A. Tosi. 1971. Forest Environments in Tropical Life Zones. Pergamon Press, New York.

Mayo, S. J., J. Bogner & P. C. Boyce. 1997. The Genera of Araceae. Royal Botanic Gardens, Kew.

Prance, G. T. 1982. Forest refuges: Evidence from woody angiosperms. Pp. 137–158 *in* G. T. Prance (editor), Biological Diversification in the Tropics. Columbia Univ. Press, New York.

Chaetanthera kalinae (Mutisieae, Asteraceae), a New Species from Chile

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Abstract. *Chaetanthera kalinae*, a new annual species of *Chaetanthera* Ruiz & Pavón, has been discovered from the Cordillera de Doña Ana and the Sierra de Tatul del Medio in Chile. This yellow-flowered, pseudorosette-forming species from the subgenus *Tylloma* is described, illustrated, and discussed in the context of the morphologically most similar taxa: *C. limbata* (yellow-flowered, lax annual) and *C. lanata* (white-flowered, pseudorosette-forming perennial; subgenus *Carmelita*).

Resumen. Se describe una nueva especie anual del género *Chaetanthera* Ruiz & Pavón, *C. kalinae*, de la Cordillera de Doña Ana y la Sierra de Tatul del Medio, Chile. Pertenece al subgénero *Tylloma*, es de hábito pseudo-arrosetado y con flores marginales amarillas. Se da una descripción con ilustraciones y se discuten aspectos de su morfología en el contexto de los taxones parecidos: *C. limbata* (planta anual de hábito flojo y flores amarillas) y *C. lanata* (planta perenne, pseudo-arrosetada y flores blancas; subgénero *Carmelita*).

Key words: *Chaetanthera*, Chile, Cordillera de Doña Ana, *Tylloma*.

The genus *Chaetanthera* Ruiz & Pavón (Asteraceae, Mutisieae) currently has 42 species distributed over Chile, Argentina, Peru, and Bolivia (Davies & Facher, 2001). The center of diversity of the genus lies in the high Andes of central Chile, which has a Mediterranean-type climate zone. While studying the genus for a forthcoming revision, material of a distinct new species was found mixed in with collections of *Chaetanthera glabrata* (DC.) F. Meigen and *Chaetanthera limbata* (D. Don) Lessing. Recent collections made by M. T. Kalin Arroyo (University of Chile, Santiago) and C. Ehrhart (Ludwig-Maximilians–Universität München, Germany) confirmed the status of the material as a hitherto undescribed species. The morphology and habit of this new species places it firmly in *Chaetanthera* subg. *Tylloma* D. Don. The taxa in the subgenus *Tylloma* represent one of the most interesting species associations in *Chaetanthera* and show fascinating distribution and speciation patterns, especially in the lowland, coastal taxa. In particular, the indumentum, leaf, and involucral bract morphology can appear very polymorphic. Taxonomically, the morphological variability in the subgenus *Tylloma* has been well documented, if perhaps not well understood (Reiche, 1905; Cabrera, 1937). However, *C. kalinae*, as a higher-altitude representative of this group, is remarkably consistent and stable in its characters. This is also true for the other high-altitude member of the subgenus, *C. splendens* (Remy) B. L. Robinson.

Chaetanthera kalinae A. M. R. Davies, sp. nov. TYPE: Chile. Región de Coquimbo, Prov. de Elqui: Straße von Vicuña zum Embalse La Laguna, 30°03′S, 70°05′W, 2340 m, 27 Nov. 2002, *C. Ehrhart 2002/061* (holotype, MSB; isotypes, CONC, K, MO). Figure 1.

Planta characteristica subgenerica *Tylloma*. Planta annua herbacea, ascendens vel decumbens, ad 8 cm alta, raro ramosa. Folia pseudopetiolata, lamina spathulata vel reniforme orbiculata, limbata marginibus integris, indistincte succulenta, atrogriseo-viridis, dense albo lanata. Capitula radiata foliis superioribus subrosulatis ornata. Involucri bracteae interiores oblanceolatae, obtusae et mucronatae, membranaceae, subglabrescentes, apices pallide rosaceae. Flores radii et flores disci corolla aurea. Pappi setae ad 10 mm longae, 1–2 seriatae, albidae, basalis longe ciliatae, apicalis abrupte scabridae. Achenia ad 3.5 mm longa, brunnescentia, laxe vel densa papillosa.

Annual monoecious *herbs* to 8 cm; *roots* filiform; *stems* creeping to ascending, decumbent; stems glabrous to sparsely pubescent with white, filiform hairs; stems often buried in substrate; flowering stems originate from a central node a short distance above roots, rarely branched. *Cauline leaves* few, alternate, forming clusters at nodes and distinct rosettes below capitula with subtle morphological transition to phyllaries surrounding capitula, when dried the leaves recurve strongly and at flowering cauline leaves usually die back; *leaves* 8–9(13) × 5–6.5 mm, pseudopetiolate, pseudopetioles 5–7 mm in length, margins of pseudopetioles rarely sparsely dotted with glandular trichomes; lamina spathulate to orbicular-reniform, apices obtuse to obcordate, mucronate, bases subcordate to rounded, lamina slightly succulent,

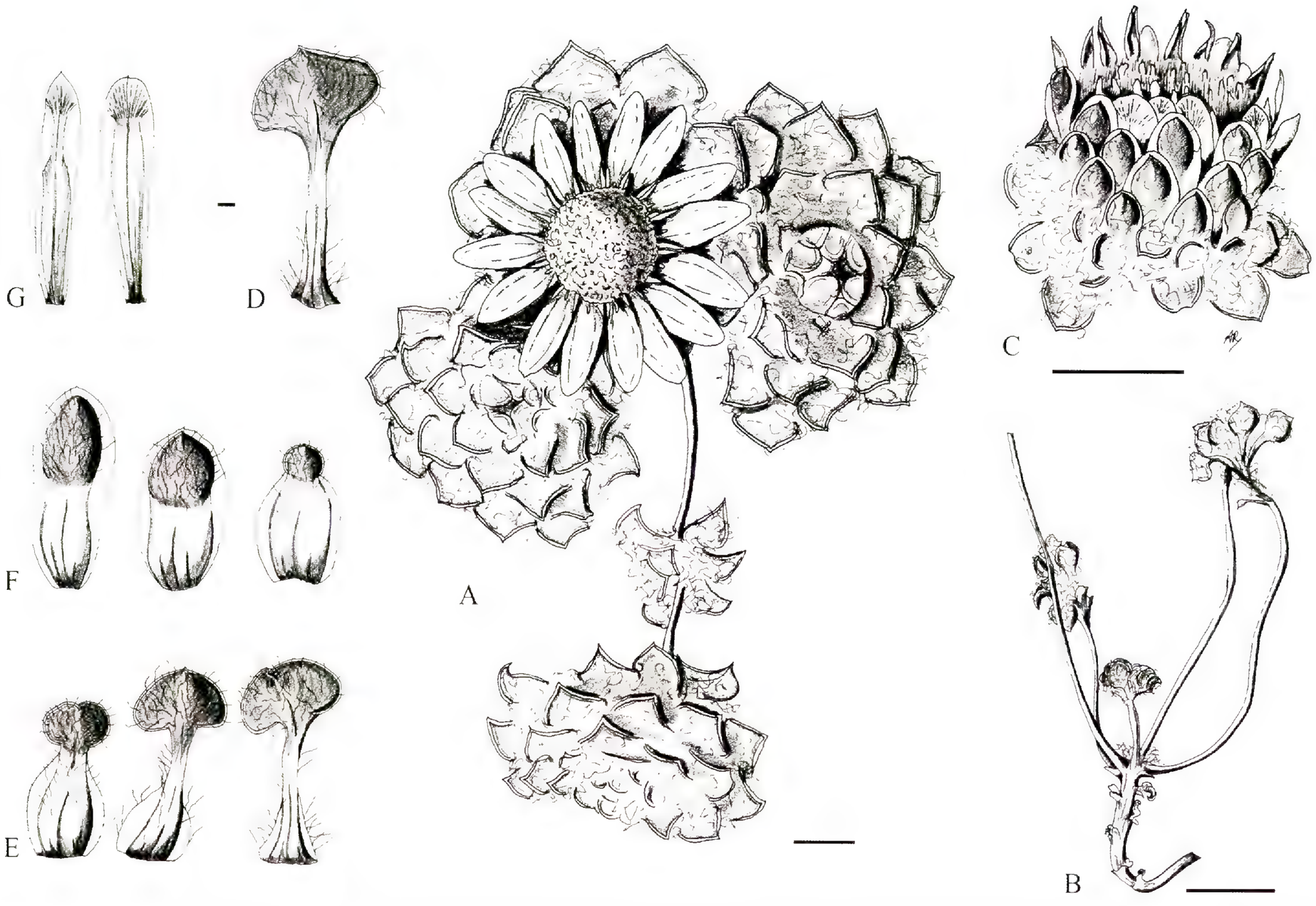

Figure 1. *Chaetanthera kalinae* A. M. R. Davies. —A. Habit, aerial view. —B. Habit, lateral view of lower stem region. —C. Capitulum detail. —D. Cauline leaf. —E. Outer involucral bracts (series progression from right to left). —F. Middle involucral bracts (series progression from right to left). —G. Inner involucral bracts (series progression from right to left). A, drawn from slide (*Ehrhart 96/1056*, MSB); B from *Wagenknecht 18117* (GH); C–G from the holotype *Ehrhart 2002/061* (MSB). Scales: A–C = 10 mm; D–G = 1 mm.

Table 1. Morphological characters defining *C. kalinae*, *C. limbata*, and *C. lanata*.

Character	*C. kalinae*	*C. limbata*	*C. lanata*
Ray color	white with red dorsal stripe	yellow	yellow
Habit	perennial, lax cushion, lignified roots	annual, decumbent, filiform roots, leaves form pseudorosette below capitula	annual, decumbent, filiform roots, leaves loosely arranged
Leaf indumentum	densely lanate abaxially and adaxially; black glandular trichomes rare and sparse on lamina margins only	mostly glabrous but villous in leaf axils (on surfaces when young); black sessile to pedicellate glandular trichomes on lamina and margins	densely lanate abaxially and adaxially
Leaf lamina	lanceolate, yellowish green acute/aciculate apices shortly sparsely barbed at base	spathulate orbicular-reniform, bases subcordate to rounded	spathulate orbicular to elongate-cordate, bases rounded to attenuate
Inner involucral bract	orbicular-reniform, bases subcordate to rounded	oblanceolate, obtuse pale pink apices	linear, acute dark pink/red apices
Pappus bristles	shortly sparsely barbed at base	longly ciliate at base	longly ciliate at base

dark gray-green, densely villous to lanate (pubescence ca. 5 mm long), margins limbate, entire. *Capitula* crateriform, solitary on flowering stem, heterogamous, radiate, full diameter 1.4–2.7(3.0) cm, disk diameter (0.4)0.9–1.5 cm, 5 to 7 per plant; *involucral bracts* in a continuous series distinguished into 3 types: outer involucral bracts as cauline leaves, 8.5–11.5 × 2.0–5.5 mm, densely white villous on laminar surfaces and on lower abaxial membranous margins, ratio of lamina to membranous margin decreases along involucral bract progression; middle involucral bract series elliptic, obtuse, lamina component much reduced and margins nearly to entirely membranous, 9–10.5 × 4–5 mm, abaxial pubescence short, sericeous, white; inner involucral bract series oblanceolate to obtuse, hyaline, ca. 13 × 3–4 mm, nearly glabrous, tinged pale pink at apices. *Ray florets* bilabiate, yellow, single series, (9)16 to 23, pistillate anthers reduced to inconspicuous staminodes, 14–15 mm long, tube 6.5 mm long; ligule 2.6 mm wide, shortly 3-dentate, abaxially sericeous, inner lip 4 mm long, bifid, acute; *disk florets* tubular, yellow, ca. 120, hermaphroditic anthers fertile, corollas 9.5 mm long, tube 8 mm long, glabrous; *styles* (ray and disk) 10 mm long, stigma lobes linear, 0.4 mm long. *Achenes* (ray and disk) turbinate, 2.5–3.5 mm long, papillose; *pappus* white, 10 mm long, ciliate below, increasingly densely scabrid to apex, in 1 to 2 series.

Most measurements were made on herbarium material. Field measurements made by M. Kalin Arroyo and I. Till-Bottraud from the "Mil Cuevas" population (collection number 25076) had much lower ray counts (≤ 16 per capitulum) and more variably sized capitula. The reduced size of populations of this species was also observed in 2004 (M. Kalin Arroyo, pers. comm.), reportedly a much drier year. These variation extremes are represented by the parenthetical values in the description. Such breadth of morphological variation is not unusual in the annual species of *Chaetanthera*. Populations of these annual species may vary in size from year to year and also with changing altitude and latitude, such variation possibly caused by differences in availability of water. From a species perspective, this can result in the emergence of trends in morphology that are not taxonomically valuable.

Distribution and habitat. This species is distributed in the upper Elqui valley in the Cordillera de Doña Ana (Río La Laguna–Río Turbio–Río Elqui) and the Sierra de Tatul del Medio (Río del Carmen–Río Huasco) in Chile. Individuals grow scattered among screes and talus, and in deep sandy soils off screes at altitudes between 2300 and 3100 m.

Phenology. These annual plants flower and fruit in December and January.

Etymology. The specific epithet "kalinae" honors Mary T. Kalin Arroyo, an active botanist and ecologist in Chile, who has an ongoing scientific interest in *Chaetanthera* and who has contributed significantly to the collection and understanding of the genus.

The annual decumbent habit, floral morphology, basally ciliate pappus bristles, and turbinate, papillose achenes of *Chaetanthera kalinae* place it definitively in *Chaetanthera* subg. *Tylloma*. The entire limbate leaf margin indicates it is most closely related to taxa within the *C. limbata–C. glabrata* complex. Historically, this complex was first studied in detail by Reiche (1905) as part of his floristic work of Chile. He recognized that the taxa within *Tylloma* were highly polymorphic, so much so that he felt compelled to subdivide *C. glabrata* into six varieties and retained two further taxa (*Tylloma ciliatum* Philippi and *Tylloma limbatum* D. Don) based principally on the indumentum types. Cabrera (1937) dealt with this complex by reducing the annual *Tylloma* taxa with entire lamina margins to two species: *C. glabrata*, including everything that was glabrous, and *C. limbata*, including all plants with variably glabrous to lanuginous stems and leaves. While this concept allowed the natural segregation of the glabrous from the pubescent, it supported two entities with highly polymorphic leaf shape, leaf size, and involucral bract shape. Current revision work has shown that indumentum type plays a significant role in delimiting natural taxa in this group, while the polymorphic characters mentioned above are not taxonomically valuable. Seven taxa can be recognized, of which *C. kalinae* is one of two new to science. *Chaetanthera limbata* is principally distinguished from *C. kalinae* by typically only having long filamentous hairs tufted in the axils, although according to the protologue the young leaves may have woolly surfaces ("Folia...juniora praecipue supra lanigera" Don (1830: 238)). The leaves also have black sessile to pedicellate glandular trichomes on the lamina and margins. The leaf lamina is orbicular to elongate-cordate instead of orbicular-reniform, and the inner involucral bracts are linear with acute pink-red apices. *Chaetanthera kalinae* can be distinguished from other similar species by its unique combination of broadly spathulate, orbicular-reniform, densely lanate leaves and outer phyllaries, the broadly oblanceolate, inner series of phyllaries with obtuse pale pink tips, and yellow rays. It may be possible to confuse this annual with younger or poorly pressed forms of the perennial *C. lanata* (Philippi) I. M. Johnston. *Chaetanthera lanata* is distinguished from *C. kalinae* primarily by its perennial life form with tough, lignified roots and spreading cushion habit, having white rays with a red dorsal stripe and pappus bristles that are shortly sparsely barbed at the base. *Chaetanthera lanata* is further differentiated from *C. limbata* by having lanceolate inner involucral bracts with yellowish green acute or aciculate apices. Table 1 lays out the characters that define the three morphologically similar species *C. kalinae*, *C. limbata*, and *C. lanata*.

Not all the characters referred to in Table 1 are always represented on herbarium sheets, especially on older collections, hence the potential for confusion. The species are absolutely distinct in the field.

The Cordillera de Doña Ana is a *locus classicus* for several *Chaetanthera* taxa, particularly those based on material collected by Claudio Gay in the 1830s and described by Remy in Gay's (1848) *Flora de Chile*. However, it is interesting to have novel collections from this area that was previously so intensively botanized. Other taxa have also recently been collected and described from this area (e.g., *Calceolaria flavovirens* C. Ehrhart, 2000).

The publication of this new species does not affect the most recent key to the *Chaetanthera* species published by Katinas (1996) for the Argentinian taxa because *C. kalinae* appears to be very localized in the regions of Coquimbo and Atacama in Chile. A new record of *C. limbata* aff. for San Juan, Argentina (Tombesi, 2000), has been confirmed to be a yellow-flowered perennial specimen (*Kiesling, Ulibarri & Kraporickas 7504*, SI image), which is clearly not *C. kalinae* and would appear to be much closer to *C. lanata*.

Paratypes. CHILE. **III Región de Atacama:** Prov. de Huasco camino entre San Felix y Miña Pascua Lama, sect. El Nevado, *M. T. Kalin Arroyo & Till-Bottraud 25090* (CONC). **IV Región de Coquimbo:** Prov. de Elqui curva 9, sector "Mil Cuevas" camino entre Guanta y Baños del Toro *M. T. Kalin Arroyo & Till-Bottraud 25076* (CONC); Rodados Río Seco, 3 km E of Nueva Elqui, *R. Wagenknecht 18117* (G, GH); Weg von Las Juntas im Elqui Tal zu den Baños del Toro, *F. Hellwig 1671* (G); Straße von Vicuña zum Embalse La Laguna km 112, Flußbett–Schotter, *C. Ehrhart & E. Sonderegger 96/1056* (MSB).

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Literature Cited

Cabrera, A. L. 1937. Revisión del género *Chaetanthera* Ruiz & Pavón (Compositae). Revista Mus. La Plata (n.s.) 1: 87–210.

Davies, A. M. R. & E. Facher. 2001. Achene hairs and their diversity in the genus *Chaetanthera* Ruiz & Pavón (Mutisieae, Asteraceae). Sendtnera 7: 13–33.

Don, D. 1830. Mr. D. Don's descriptions of new genera and species of the class Compositae. Trans. Linn. Soc. London 16: 238–239.

Ehrhart, C. 2000. Die Gattung *Calceolaria* (Scrophulariaceae) in Chile. Biblioth. Bot. 153: 1–283.

Gay, C. 1848. Historia Física y Política de Chile. Botánica 3: 284–287, 300–328 t. 35–38.

Katinas, L. 1996. Tribu XII. Mutisieae, Subtribu 3. Mutisiinae; *Chaetanthera* Ruiz & Pavón. *In:* Flora Fanerogámica Argentina, Fascículo 29, 280. Asteraceae, parte 4. Proflora CONICET, Córdoba, Argentina.

Reiche, K. 1905. Estudios críticos sobre la Flora de Chile. 5: 308–310, 330–359.

Tombesi, T. S. 2000. Novedades en *Chaetanthera* (Mutisieae, Asteraceae). Hickenia 3: 69–72.

New Combinations in *Erica* (Ericaceae: Ericoideae) from the High Mountains of East Africa

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Abstract. Three taxa found in the high mountains of East Africa are transferred from *Philippia* Klotzsch to *Erica* L., resulting in the following new combinations: *Erica johnstonii* (Schweinfurth ex Engler) Dorr, *E. trimera* subsp. *abyssinica* (Pichi-Sermolli & Heiniger) Dorr, and *E. trimera* subsp. *meruensis* (R. Ross) Dorr. A neotype is selected for *Philippia johnstonii* Schweinfurth ex Engler, which is the basionym of *E. johnstonii*. A key to the five subspecies of *E. trimera* (Engler) Beentje also is provided.

Key words: East Africa, *Erica*, Ericaceae, *Philippia*.

The rationale for submerging the genus *Philippia* Klotzsch in *Erica* L. has been amply documented by Oliver (1987, 1988, 2000), who recognized that the character used to distinguish the two genera, the degree of recaulescence of the bract, is unreliable and breaks down especially in species referred to *Philippia*. Accordingly, nomenclatural changes have been proposed for the species of *Philippia* found in southern Africa (Oliver, 1987), East Africa (Beentje, 1990; Dorr, 1994), the Flora Zambesiaca region (Oliver, 1992), the Mascarene Islands (Oliver, 1993), Madagascar and the Comoro Islands (Dorr & Oliver, 1999a), and São Tomé (Dorr & Oliver, 1999b). These papers disposed of most, but not all, of the names in that genus.

While curating material in the U.S. National Herbarium, it was discovered that three taxa of *Philippia* occurring in the high mountains of East Africa continue to lack names in the genus *Erica*. Lebrun and Stork (1997: 18) earlier had mentioned part of this lingering problem when they listed four names in tropical African *Philippia* that would eventually have to be reclassified as *Erica*. Two of the names they listed, *P. abyssinica* Pichi-Sermolli & Heiniger and *P. johnstonii* Schweinfurth ex Engler, are transferred here; one name, *P. kemensis* [sic] S. Moore, clearly an orthographic corruption of *P. keniensis* introduced by the scanning process used to create the electronic version of *Index Kewensis* (Anonymous, 1993), is now *E. trimera* subsp. *keniensis* (S. Moore) Beentje; and the fourth name, *P. multiglandulosa* (Klotzsch) Alm & T. C. E. Fries, is considered to be a synonym of *E. galioides* Lamarck (Oliver, 1993: 768). Lebrun and Stork (1997) overlooked *P. keniensis* subsp. *meruensis* R. Ross, which also is transferred to *Erica* here.

Erica johnstonii (Schweinfurth ex Engler) Dorr, comb. nov. Basionym: *Philippia johnstonii* Schweinfurth ex Engler, Pflanzenw. Ost-Afrikas C: 302, tab. 33, fig. J-T. 1895 [as "*Johnstonii*"]. TYPE: Democratic Republic of the Congo, Nord-Kivu: Ruwenzori, vallée de la Lamuri [= Ruanoli, 00 36′N, 29 52′E, fide Bamps, 1982], ca. 4000 m, 29 May 1914, *J. Bequaert 4527* (neotype, designated here, BR; isotype, US).

In the protologue of *Philippia johnstonii*, Engler (1895) only cited two collections (*F. L. Stuhlmann 2374, 2458*), which subsequently were destroyed at Berlin. Because no duplicate has been found of either syntype, a collection from the type locality (i.e., Ruwenzori) is chosen as neotype.

Erica johnstonii can only be confused with *E. rossii* Dorr, which also has 3-merous flowers. Alm and Fries (1927a) placed *E. johnstonii* and *E. rossii* (treated as *Philippia johnstonii* and *P. excelsa* Alm & T. C. E. Fries, respectively) together in *Philippia* subgen. *Afrophilippia* Alm & T. C. E. Fries, which they circumscribed as having a 3-merous calyx and corolla, 6 free stamens, and 3-locular ovary. They and subsequent authors (e.g., Hedberg, 1957: 142), while acknowledging that the two species are closely related, have distinguished them by the degree to which the calyx is connate. In *E. johnstonii*, the calyx is connate only for the lower 1/4 or less of its length, while in *E. rossii* it is connate for the lower 1/3 or 1/2 of its length. Additionally, Hedberg (1957: 301) noted that the two smaller sepals of *E. johnstonii* are more or less lanceolate and 1.5 to 2 times longer than wide, while those of *E. rossii* are broadly triangular and about as long as wide.

Erica johnstonii and *E. rossii* are geographically distinct. The former species is known from the

Virunga Mts. (Democratic Republic of the Congo), Ruwenzori (Democratic Republic of the Congo and Uganda), and Rwanda. The latter one is found on Mt. Elgon (Kenya and Uganda), the Aberdare Mts. (Kenya), Mt. Kilimanjaro (Tanzania), and Mt. Meru (Tanzania).

Although the specific epithet of *Erica johnstonii* is superficially similar to that of *E. johnstoniana* Britten, which occurs in Malawi, Mozambique, Zimbabwe, and possibly Tanzania (Ross, 1983), the *International Code of Botanical Nomenclature* (Greuter et al., 2000) does not consider these endings to be incompatible (see Art. 53, Ex. 10, where *Lysimachia hemsleyana* D. Oliver and *L. hemsleyi* Franchet are cited as examples of "names not likely to be confused").

Erica trimera (Engler) Beentje subsp. **abyssinica** (Pichi-Sermolli & Heiniger) Dorr, comb. nov. Basionym: *Philippia abyssinica* Pichi-Sermolli & Heiniger, Webbia 9: 29, tab. 5, 6. 1953. *Philippia keniensis* S. Moore subsp. *abyssinica* (Pichi-Sermolli & Heiniger) R. Ross, Bull. Jard. Bot. État 27: 748. 1957. *Philippia trimera* Engler subsp. *abyssinica* (Pichi-Sermolli & Heiniger) Hedberg, Symb. Bot. Upsal. 15(1): 301 [validating reference to basionym on p. 298]. 1957. TYPE: Ethiopia. Arussi Prov.: Scirè [= Sirè, E of Lake Auasa], 2800 m, 1 Feb. 1938, *R. Milchersich 44* (holotype, FT not seen).

This subspecies is endemic to the highlands of Ethiopia.

Erica trimera (Engler) Beentje subsp. **meruensis** (R. Ross) Dorr, comb. nov. Basionym: *Philippia keniensis* S. Moore subsp. *meruensis* R. Ross, Bull. Jard. Bot. État 27: 747. 1957. TYPE: Tanzania. Mt. Meru, 11,000–12,000 ft., 29 Sep. 1932, *B. D. Burtt 4063* (holotype, K not seen; isotypes, BR, EA).

This subspecies is endemic to Mt. Meru, Tanzania.

Erica trimera (Engler) Beentje is here considered to consist of geographically isolated but related populations in the high mountains of East Africa, all of which share a 4-merous flower, 8 anthers connate until anthesis, then becoming free, leaves in whorls of 3, and an absence of barbellate, or plumose, hairs. Various taxonomic interpretations of these populations have been proposed. They have been treated as three species of *Philippia* and one of *Erica* by Alm and Fries (1927a, 1927b); six different subspecies of *P. trimera* Engler by Hedberg (1957); and *P. trimera* and four subspecies of *P. keniensis* by Ross (1957). The present circumscription of *E. trimera* recognizes the five taxa recognized by Ross (1957), albeit with the current nomenclatural innovation.

Key to the Subspecies of *Erica trimera*

1a. Young stems with long glandular hairs (sometimes sparsely glandular pubescent or even glabrous).
  2a. Margin of all calyx segments glandular; margin of leaf blades ciliate and minutely glandular when young; Ethiopia . . . . . .subsp. *abyssinica*
  2b. Margin of calyx segments eglandular (sometimes a few glands on the largest, fused sepal); margin of leaf blades glandular-dentate; Democratic Republic of the Congo and Uganda (Ruwenzori Mts.) . . . . . .subsp. *trimera*
1b. Young stems without glandular hairs (always pubescent).
  3a. Margin of leaf blades glandular; Kenya and Uganda (Mt. Elgon) . . . . . .subsp. *elgonensis*
  3b. Margin of leaf blades eglandular.
    4a. Leaf blades pubescent above and near the margin below; margin of leaf blades ciliate, eglandular; pedicels sparsely pubescent throughout; Tanzania (Mt. Meru) . . . . . subsp. *meruensis*
    4b. Leaf blades glabrous above (or with a few scattered hairs on the proximal part of the upper surface); margin of leaf blades ciliate, glandular; pedicels glabrous, except sometimes at the base; Kenya (Mt. Kenya) and Tanzania (Mt. Kilimanjaro and Mt. Loolmalassin) . . . . . subsp. *keniensis*

Literature Cited

Alm, C. G. & T. C. E. Fries. 1927a. Monographie der Gattungen *Philippia* Klotzsch, *Mitrastylus* nov. gen. und *Ericinella* Klotzsch. Svenska Vetenskapsakad. Handl., ser. 3, 4(4): 1–49.

——— & ———. 1927b. Die tropischen Arten der Gattung *Erica* L. Ark. Bot. 21A(7): 1–21.

Anonymous. 1993. Index Kewensis: On compact disc. Version 1.1. Oxford Univ. Press, Oxford.

Bamps, P. 1982. Flore d'Afrique centrale (Zaire–Rwanda–Burundi): Répertoire des lieux de récolte., Jardin botanique national de Belgique, Meise, Belgium.

Beentje, H. J. 1990. Name changes in East African Ericaceae. Utafiti 3: 13.

Dorr, L. J. 1994. A new name and a new combination in East African *Erica* (Ericaceae: Ericoideae). Novon 4: 220.

——— & E. G. H. Oliver. 1999a. New taxa, names, and combinations in *Erica* (Ericaceae: Ericoideae) from Madagascar and the Comoro Islands. Adansonia, sér. 3, 22: 1–17.

——— & ———. 1999b. A new combination in *Erica* (Ericaceae) from São Tomé. Kew Bull. 54: 235–236.

Engler, A. (editor). 1895. Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete. C. Verzeichniss der bis jetzt aus Ost-Afrika bekannt gewordenen Pflanzen, mit 45 Tafeln. Dietrich Reimer, Berlin.

Greuter, W., J. McNeil, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (St. Louis Code). Regnum Veg. 138.

Hedberg, O. 1957. Afroalpine vascular plants. A taxonomic revision. Symb. Bot. Upsal. 15: 1–411.

Lebrun, J.-P. & A. L. Stork. 1997. Énumération des plantes à fleurs d'Afrique tropicale. IV. Gamopétales: Ericaceae à Lamiaceae. Éditions des Conservatoire et Jardin botaniques Genève, Genève.

Oliver, E. G. H. 1987. Studies in the Ericoideae (Ericaceae). VII. The placing of the genus *Philippia* in synonymy under *Erica*; the southern African species. S. African J. Bot. 53: 455–458.

———. 1988. Studies in Ericoideae (Ericaceae). VI. The generic relationship between *Erica* and *Philippia* in southern Africa. Bothalia 18: 1–10.

———. 1992. Studies in the Ericoideae (Ericaceae). VIII. New combinations for *Philippia* are made in *Erica* for the Flora Zambesiaca region. Kew Bull. 47: 665–668.

———. 1993. Studies in the Ericoideae (Ericaceae). X. Nomenclatural changes for the Flore des Mascareignes region. Kew Bull. 48: 767–769.

———. 2000. Systematics of Ericeae (Ericaceae: Ericoideae) species with indehiscent and partially indehiscent fruit. Contr. Bolus Herb. 19: 1–483.

Ross, R. 1957. Notes on *Philippia*. Bull. Jard. Bot. État 27: 734–754.

———. 1983. Ericaceae. *In:* E. Laurent (editor), Flora Zambesiaca 7(1): 157–181.

Typification of *Elaeocarpus decipiens* (Elaeocarpaceae) and Its New Variety from Taiwan, China

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Abstract. In preparing the treatment of the Elaeocarpaceae for the *Flora of China*, lectotypification is indicated for *Elaeocarpus decipiens* Hemsley ex Forbes & Hemsley and further nomenclatural change is required regarding a related taxon from Taiwan. The name *Elaeocarpus lanyuensis* C. E. Chang is invalid because the type was not indicated in the protologue, and the combination *E. sylvestris* var. *lanyuensis* (C. E. Chang) C. E. Chang is therefore illegitimate. *Elaeocarpus decipiens* Hemsley ex Forbes & Hemsley var. *changii* Y. Tang is published as a new variety, replacing these earlier names.

Key words: China, Elaeocarpaceae, *Elaeocarpus*, Taiwan.

Among Chinese Elaeocarpaceae, *Elaeocarpus sylvestris* (Loureiro) Poiret, *E. decipiens* Hemsley ex Forbes & Hemsley, and *E. glabripetalus* Merrill are often confused, and the latter two names are often treated as synonyms of the first (e.g., Gagnepain, 1919, 1945; Merrill & Chun, 1935; Metcalf, 1941; Hara, 1951; C. E. Chang, 1977). More recently, Chang Hongta (1979, 1989) treated *E. decipiens*, *E. sylvestris*, and *E. glabripetalus* as three distinct species. However, collections from Taiwan remain unresolved. Although *E. decipiens* was reported from Taiwan, the taxon was a mixture of *E. decipiens* and *E. sylvestris*, as determined from its description, drawing, and specimens cited by Li in 1963. *Elaeocarpus decipiens* was subsequently treated as a synonym of *E. sylvestris* in both editions of the *Flora of Taiwan* (C. E. Chang, 1977, 1993). Based on our examination of exsiccatae from Taiwan (*Suzuki 6129* (IBSC), *Tanaka & Shimida 11142* (IBSC), *Morris s.n.* (IBSC), *Southwest Forest College herbarium no. 4471* (SWFC)), we confirmed that *E. decipiens* does occur in Taiwan. Based on additional study of specimens from mainland China and adjacent areas including Indochina and Japan, *E. sylvestris*, *E. decipiens*, and *E. glabripetalus* were easily distinguished (Tang, 1992) as follows:

Key to *Elaeocarpus decipiens* and Related Species from China, Indochina, and Japan

1a. Branchlets bright brown when dried, glabrous, angular; leaves subsessile, with petioles less than 5 mm long, usually greenish yellow when dried; petals glabrous, upper half of each petal divided into 15 segments; fruit 1–1.5 cm diam. . . . . *E. glabripetalus* Merrill

1b. Branchlets black-brown when dried, puberulent or sparsely pilose, not angular; leaf petioles 10–20 mm long, leaves black-brown when dried; petals puberulent on either side, upper half of each petal divided into 10 or 14 to 16 segments; fruit ca. 0.7 or 1.5–2 cm diam.

2a. Leaves usually obovate, papery, lateral veins 4 or 5, with indistinct anastomosing veinlets; petals abaxially puberulent at base, segments 10; stamens 15. . . . *E. sylvestris* (Loureiro) Poiret

2b. Leaves lanceolate or narrowly oblong, leathery, lateral veins 7 to 9, with prominent anastomosing veinlets, petals adaxially puberulent at base, segments 14 to 16; stamens 25 to 30. . . . . *E. decipiens* Hemsley ex Forbes & Hemsley

3a. Leaf blade 7–13.5 × 2–4 cm, without glands in axils of lateral veins, petiole 1–2 cm; fruit ca. 2 cm diam.; stamens 25 to 30; ovary densely tomentose . . . . . *E. decipiens* var. *decipiens*

3b. Leaf blade 4.5–7 × 1.2–2.5 cm, with glands in axils of lateral veins, petiole less than 1 cm; fruit 0.7–0.8 cm diam.; stamens ca. 20; ovary glabrescent . . . . . *E. decipiens* var. *changii* Y. Tang

In addition, because its leaves look similar to *Elaeocarpus decipiens*, *E. hayatae* Kanehira & Sasaki sometimes was treated as a synonym of *E. decipiens* (H. T. Chang, 1989). *Elaeocarpus hayatae* differs from *E. decipiens* mainly in having 4- or 5-loculed ovaries and fruit (vs. 3-loculed ovaries and 1-loculed fruit in *E. decipiens*).

When describing *Elaeocarpus decipiens*, Forbes and Hemsley (1886) cited three specimens, *Wright s.n.* (from Luchu Archipelago [Ryukyu Islands], Japan), *Reeves s.n.* (from Kwangtung [Guangdong], China), and provisionally *Oldham 54* (from Formosa [Taiwan], China), this last collection cited with a question mark, but they failed to designate a type specimen. Lectotypification is therefore indicated, as supported by Articles 9.2 and 9.9 of the *ICBN (St. Louis Code)* (Greuter et al., 2000). Because Forbes and Hemsley were not sure about *Oldham 54*, this specimen is excluded from lectotypification. Examination of photographs of the first two cited specimens reveals that

Reeves s.n. is more appropriately identified as *E. sylvestris*. Consequently, *Wright s.n.* is the only candidate for lectotype among the original syntypes of *E. decipiens*. For *Wright s.n.*, two gatherings, one flowering specimen on the upper portion and one fruiting specimen on the lower portion, appear on the same herbarium sheet. These two gatherings are quite different and were probably made at different times. The handwritten annotation "*E. decipiens* Hemsl." is associated with the fruiting specimen. An additional annotation "cf. *E. photiniaefolius*" may be seen with the flowering specimen. Therefore, only the fruiting specimen represents *E. decipiens*. Because this fruiting specimen represents the only unambiguous material among the cited syntypes for *E. decipiens*, *Wright s.n.* is designated as the lectotype of *E. decipiens*.

Elaeocarpus decipiens Hemsley ex Forbes & Hemsley, J. Linn. Soc. 23: 221. 1886. TYPE: Japan. "Loo-Choo Islands" [Ryukyu Islands], *Wright s.n.* (lectotype, designated here, fruiting specimen at sheet lower right, K not seen, K photo at SZ).

Elaeocarpus decipiens Hemsley ex Forbes & Hemsley var. **changii** Y. Tang, var. nov. *Elaeocarpus lanyuensis* C. E. Chang, Quart. J. Chin. Forest. 21: 113. t. 1. 1988, nom. invalid. *E. sylvestris* var. *lanyuensis* (C. E. Chang) C. E. Chang, Flora of Taiwan, ed. 2, 3: 720. 1993, nom. illeg. TYPE: China. Taiwan. Lanyu Island, *C. E. Chang 14930* (holotype, PPI, photo SZ).

Foliis oblongis, firmiter chartaceis usque 4.5–7 cm longis, 1.2–2.5 cm latis, nervis utrinque 6 ad 8, in axillis nervorum glandulis; petalis laciniatis; staminibus circiter 20; ovario glabrescenti; fructibus circiter 15–18 mm longis, 7–8 mm diametro.

The variety *changii* is very similar to *Elaeocarpus decipiens* var. *decipiens*, but differs in having smaller leaf blades 4.5–7 × 1.2–2.5 (vs. 7–13.5 × 2–4) cm, glands in axils of lateral veins, a glabrescent (vs. tomentose) ovary, and smaller fruit, 1.5–1.8 × 0.7–0.8 (vs. 2–3.5 × 1.7–2) cm.

C. E. Chang (1993) considered *Elaeocarpus lanyuensis* C. E. Chang to be similar to *E. sylvestris* and therefore reduced it to a variety of the latter. However, its thickly papery oblong leaves, less than 1 cm petioles, 6 to 8 lateral veins, 14 to 16 petal segments, and ca. 20 stamens indicate that Chang's *E. lanyuensis* is more similar to *E. decipiens*. The photo of the type specimen *Chang 14930* (C. E. Chang, 1993) appears very similar to one of a syntype of *E. decipiens* (*Wright s.n.* [K]) collected from the Ryukyu Islands in Japan.

Because two specimens, *Chang 18289* and *Chang 18372*, were cited for *Elaeocarpus lanyuensis* (C. E. Chang 1988), but without indication of the type in the protologue, the name *E. lanyuensis* C. E. Chang is invalid under the *ICBN (St. Louis Code)*, Articles 37.1 and 37.5 (Greuter et al., 2000). In 1993, C. E. Chang reduced this to a variety of *E. sylvestris* (Loureiro) Poiret. Because the name *E. lanyuensis* is not validly published, this later combination *E. sylvestris* var. *lanyuensis* (C. E. Chang) C. E. Chang is also illegitimate.

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Literature Cited

Chang, C. E. 1977. Elaeocarpaceae. Pp. 684–691 *in* H. L. Li, T. S. Liu, T. C. Huang, T. Koyama & C. E. DeVol (editors), Flora of Taiwan, 1st ed., Vol. 3. Epoch Publishing, Taipei.

———. 1988. A new species of *Elaeocarpus* L. from Taiwan. Quart. J. Chin. Forest. 21: 113–114.

———. 1993. Elaeocarpaceae. Pp. 714–721 *in* T. C. Huang (editor), Flora of Taiwan, 2nd ed., Vol. 3. Editorial Committee of the Flora of Taiwan, Lungwei Printing, Taipei.

Chang, H. T. 1979. New taxa of Elaeocarpaceae from China. Acta Phytotax. Sin. 17: 52–59.

———. 1989. Flora Reipublicae Popularis Sinicae, Tomus 49(1). Science Press, Beijing.

Forbes, F. B. & W. B. Hemsley. 1886. Index Flora Sinensis. J. Linn. Soc. 23: 94–95.

Gagnepain, F. 1919. *Elaeocarpus*. *In:* H. Lecomte (editor), Flore Générale l'Indo-Chine, Vol. 1. Masson et Cie, Paris.

———. 1945. *Elaeocarpus*. Pp. 475–501 *in* H. Humbert (editor), Supplément Flore Générale de l'Indo-Chine, Vol. 1. Masson et Cie, Paris.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Hara, H. 1951. Notes on Japanese *Elaeocarpus*. J. Jap. Bot. 26(3): 91–94.

Li, H. L. 1963. Woody Flora of Taiwan. The Morris Arboretum, Philadelphia, Pennsylvania, and Livingston Publishing, Narberth, Pennsylvania.

Merrill, E. D. & W. Y. Chun. 1935. Additions to our knowledge of the Hainan flora. Sunyatsenia 2: 203–344.

Metcalf, F. P. 1941. *Elaeocarpus decipiens* Hemsley. Sunyatsenia 6(1): 178–181.

Tang Y. 1992. Notes on the genus *Elaeocarpus* Linn. from China. Acta Phytotax. Sin. 30: 385–401.

A New Species of *Cassipourea* (Rhizophoraceae) from Western Cameroon

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ABSTRACT. The new species *Cassipourea korupensis* Kenfack & Sainge (Rhizophoraceae) from western Cameroon is described and illustrated, and its conservation status discussed. Unlike other species of subgenus *Lasiosepalum* Alston, in which it is provisionally placed, the new species has a distinctive glabrous ovary and a cupuliform calyx.

Key words: *Cassipourea*, Korup Forest Dynamics Plot, Korup National Park, Rhizophoraceae, southwest Cameroon.

During the establishment of the 50-hectare Korup Forest Dynamics Plot in southern Korup National Park in 1997 (Chuyong et al., 2004), we came across a new species that undoubtedly belongs in the genus *Cassipourea* Aublet (Rhizophoraceae), because of its opposite and stipulate leaves, articulate pedicel, superior ovary, and nectary. However, it does not match any of the species of the genus in Rhizophoraceae so far described from western and central Africa (Alston, 1925; Pellegrin, 1953; Liben, 1986, 1987; Floret, 1986, 1988), and its classification within the seven subgenera currently recognized within the genus *Cassipourea* (Alston, 1925; Floret, 1988) is unclear. The calyx of the new species is tomentose within, and this character clearly excludes it from the five (of seven) subgenera that have calyces glabrous or glabrescent within: *Cassipourea* subgenera *Weihea* (Sprengel) Alston, *Pumiloweihea* Floret, *Dinklageoweihea* (Engler) Floret, *Zenkeroweihea* (Engler) Floret, and *Dactylopetalum* (Bentham) Alston. The thecae of the anthers in the new species have long, fine, flexuous trichomes, separating it from *Cassipourea* subg. *Cassipourea*, which has glabrous thecae. The new species fits best within *Cassipourea* subg. *Lasiosepalum* Alston, based on the apical articulation of its pedicel, stamens more than four times as many as the petals or the sepals and inserted outside the disk, and the pubescent anther thecae. However, the new species is distinct from other members of subgenus *Lasiosepalum* in two important characters: first, the ovary is completely glabrous, and second, the calyx is cupuliform, lacking long and reflexed lobes. We consider the available information sufficient to place the new taxon in subgenus *Lasiosepalum*, but further studies are needed to confirm this placement. Given the differences with six of the seven subgenera described above and the two characters separating our specimens from the other species of subgenus *Lasiosepalum*, we are confident in describing *Cassipourea korupensis* as a distinctive new species.

Cassipourea korupensis Kenfack & Sainge, sp. nov. TYPE: Cameroon. South West Province: Ndian Div., Korup Nat. Park, ca. 180 m, 05°03′86″N, 08°51′17″E, 11 Apr. 2003 (fl), *M. Sainge 1101* (holotype, YA; isotypes, K, LBV, MO, SCA, WAG). Figure 1.

Haec species arbor sylvicola quoad sepala intus dense tomentosa atque stamina pubescentia ad species *Cassipoureae* subgeneris *Lasiosepali* maxime accedit, sed ab eis calyce cupuliformi atque ovario glabro distinguitur.

Tree, to ca. 10 m tall and 30 cm DBH, crown dense; branches terete, glabrescent to shortly appressed-puberulous; internodes (25–)35–60(–80) cm

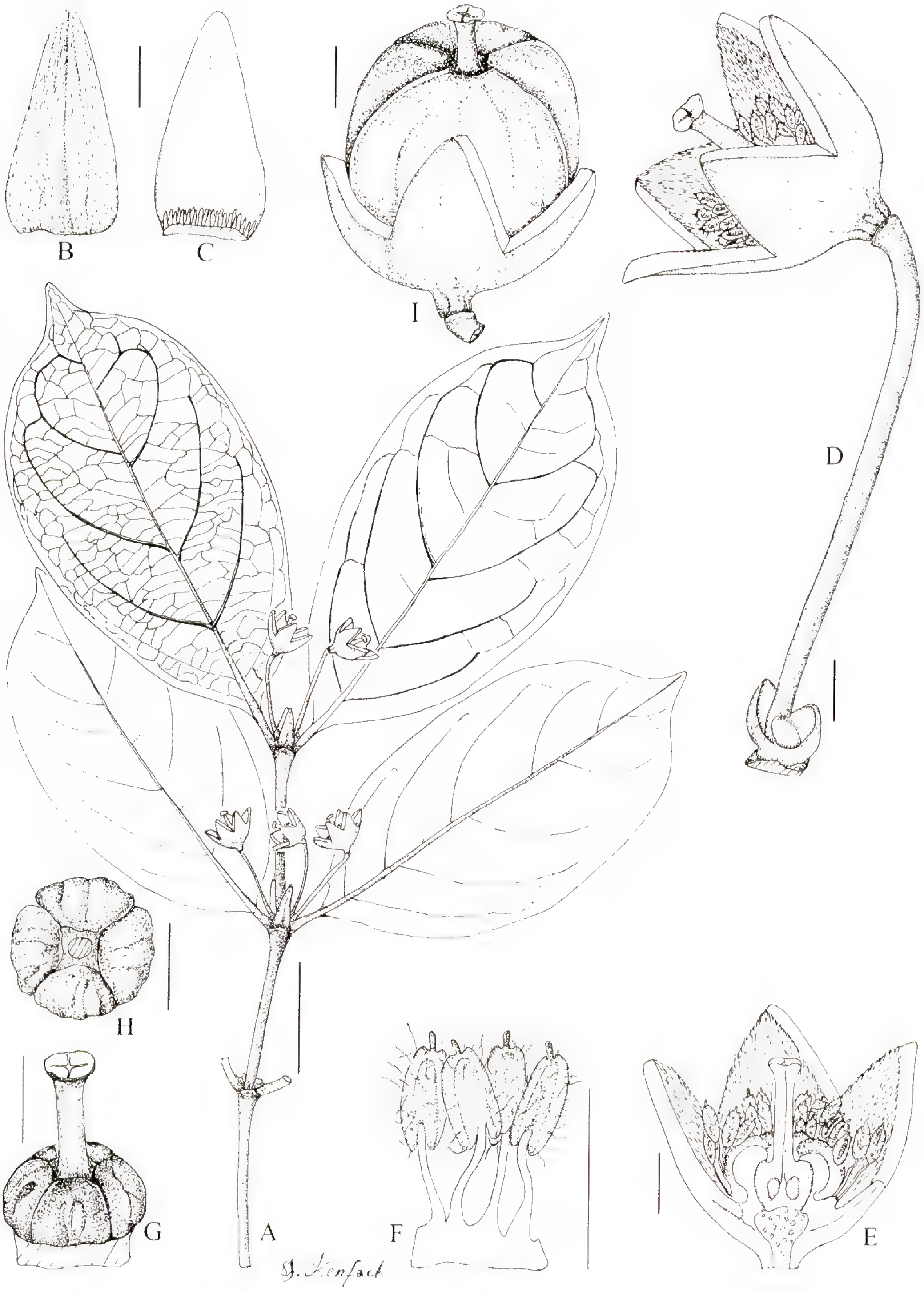

Figure 1. *Cassipourea korupensis* Kenfack & Sainge, sp. nov. —A. Flowering branch. —B. Outer surface of stipule. —C. Inner surface of stipule. —D. Flower without petals. —E. Longitudinal section of a flower. —F. Dorsal view of a fragment of the androecium. —G. Pistil. —H. Ovary from above with style removed. —I. Fruit with persistent calyx. Scale bar: A = 3 cm; B–I = 3 mm. A–H drawn from *M. Sainge 1101* (YA); I drawn from *Kenfack 1186* (MO).

long. Stipules usually persistent at 2 terminal nodes, caducous on subsequent ones, triangular, 8–11 mm long, 4–5 mm wide at base, subacute to obtuse at apex, with a diffuse midrib, abaxial surface densely appressed-pubescent to glabrescent, adaxial surface glabrous, with a line of ca. 30 colleters at base; petiole glabrous, stout, 5–11 mm long; lamina glabrous, broadly elliptic to elliptic-lanceolate, abruptly acuminate at apex, cuneate to ± rounded at base, entire at margin, coriaceous, 7–16 × 3.5–8.5 cm, with 4 to 6 pairs of lateral nerves on each side of midrib, visible but not conspicuous on upper surface, prominent on lower surface. *Inflorescence* axillary, fasciculate, 1- to 4-flowered; bracts ovate, 2–3 mm long, ca. 3 mm wide, tomentulose outside, glabrous inside; pedicel green, drying brown, glabrous, rarely glabrescent, (12–)20–25 mm long, articulated less than 2 mm from the apex. *Flowers* 5(or 6)-merous; calyx white, drying brown, sparsely tomentulose outside, densely tomentose inside, cupuliform, ca. 11 mm high, 12–15 mm diam., ca. 1 mm thick, the tube 3–5 mm long, as long as or shorter than lobes, the lobes acute, 4–7 mm long; petals unknown, early caducous; stamens ca. 60, as long as or shorter than calyx tube, the filaments 2–3 mm long, inserted outside disk, the anthers oblong, apiculate, ca. 2 mm long with fine long flexuous trichomes; ovary 3- or 4-locular depressed-subglobose, ca. 2 mm high, to 3 mm diam., glabrous; style stout, to 3 mm long; stigma capitate. *Fruit* subglobose, emerging from persistent calyx, slightly depressed at the top, 8–11 mm high, glabrous.

Habitat and distribution. So far, *Cassipourea korupensis* is known only from species-rich, closed-canopy, evergreen forest at the southern end of Korup National Park. The area has been described in detail by Chuyong et al. (2004) and Thomas et al. (2003). This forest has several unusual features: very high but strongly seasonal rainfall; very leached nutrient-poor soils; and the dominant species, *Oubanguia alata* Baker f. (Lecythidaceae, formerly Scytopetalaceae), which has been rarely collected outside the Korup–Mount Cameroon area. Within the 50-hectare Korup Forest Dynamics Plot, the new species was mainly confined to the lower, flatter part of the plot, which has deeper soil, and was rare on steeper slopes (Thomas et al., 2003).

Phenology. Flowers collected in April; fruits collected in May.

Provisional conservation status. The new species *Cassipourea korupensis* is so far known only from Korup National Park, where it appears to regenerate, based on the size-class distribution. Of the 47 individuals enumerated within the 50-hectare plot, 37 had diameters less than 5 cm (Thomas et al., 2003). The protected status of Korup National Park means that the only known population of this species is free from human disturbance. This species is quite undercollected and is known so far only from the specimens cited herein despite various botanical surveys in southwest Cameroon, which might give an indication of its rarity. Based on this evidence and with the hope that its publication will contribute to a better knowledge of its distribution and conservation status, following the IUCN (2001) Red List Categories and Criteria version 3.1, we evaluate the provisional conservation status of this species as Vulnerable VU D1. However, it is likely that future surveys will show the species to be more common and more widely distributed. Despite increasing attention from botanists and forest conservation programs, the forests of the Lower Guinea refugium that includes the Korup area remain rather poorly known botanically, and most botanical surveys in the area discover new and poorly known taxa and range extensions.

Paratype. CAMEROON. **South West Province:** Korup For. Dyn. Plot, Korup Nat. Park, *Kenfack 1186* (MO, SCA, YA).

Acknowledgments. The Korup Forest Dynamics Plot Program, through which this and several other new species were discovered, was established with funding from the International Cooperative Biodiversity Groups and the Central African Regional Program for the Environment (USAID). We gratefully acknowledge the contribution of the field team, especially Mambo Peter Ekole. We thank Roy Gereau of the Missouri Botanical Garden for the Latin diagnosis.

Literature Cited

Alston, A. H. G. 1925. Revision of the genus *Cassipourea*. Bull. Misc. Inform. Kew 1925: 241–276.

Chuyong, G. B., R. Condit, D. Kenfack, E. Losos, M. Sainge, N. C. Songwe & D. W. Thomas. 2004. Korup Forest Dynamics Plot, Cameroon. *In* E. C. Losos & E. G. Leigh Jr. (editors), Forest Diversity and Dynamism: Findings from a Large-Scale Plot Network. Univ. Chicago Press, Chicago.

Floret, J.-J. 1986. *Cassipourea evrardii* (Rhizophoraceae), espèce nouvelle du Domaine Forestier Central (Zaïre). Bull. Jard. Bot. Natl. Belg. 57: 447–451.

———. 1988. *Cassipourea* Aublet (Rhizophoraceae): Organization florale et divisions subgénériques. Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 25–45.

IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN Gland, Switzerland and Cambridge, United Kingdom.

Liben, L. 1986. Deux *Cassipourea* (Rhizophoraceae) nouveaux d'Afrique Centrale. Bull. Jard. Bot. Natl. Belg. 56: 139–144.

———. 1987. Rhizophoraceae. *In* P. Bamps (editor), Flore d'Afrique Centrale (Zaire-Rwanda-Burundi), Spermatophytes. Jardin botanique national de Belgique, Brussels.

Pellegrin, F. 1953. Les Rhizophoraceae d'Afrique équatoriale française. Notul. Syst. (Paris) 14: 292–300.

Thomas, D. W., D. Kenfack, G. B. Chuyong, M. Sainge, E. C. Losos, R. S. Condit & N. C. Songwe. 2003. Tree Species of Southwestern Cameroon: Tree Distribution Maps, Diameter Tables and Species Documentation of the 50-hectare Korup Forest Dynamics Plot. Center for Tropical Forest Science, Smithsonian Institution, Washington D.C.

A New Species and Notes on *Drymonia* (Gesneriaceae) from Costa Rica

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Abstract. A new species of *Drymonia* Martius, *D. rubripilosa*, is described, illustrated, and compared to *D. multiflora* (Oersted ex Hanstein) Wiehler, its closest presumed relative. The new species is distinguished by its sparsely to densely red-pilose stem apices, petioles, pedicels, calyxes, corollas, and ovaries. Its bivalved, fleshy capsule with fleshy indehiscent endocarp concealing the seeds is unique for Costa Rican species, shared otherwise only with *D. folsomii* and *D. multiflora*. Taxonomic comparison with *D. multiflora* and keys to separate the latter from *D. rubripilosa* are discussed.

Resumen. Se describe e ilustra una nueva especie de *Drymonia* Martius, *D. rubripilosa*, y se la compara con *D. multiflora* (Oersted ex Hanstein) Wiehler, especie que se presume es su pariente más cercana. La nueva especie se distingue por sus ramitas distales, pecíolos, pedicelos, cálices, corolas y ovarios esparcida a moderadamente rojo-pilosos. Su cápsula bivalvada, carnosa, con el endocarpo indehiscente y carnoso, que cubre a las semillas, es único para las especies costarricenses, y compartido únicamente con *D. folsomii* y *D. multiflora*. Se hace la comparación taxonómica con *D. multiflora* y se discuten las claves para separar a ésta de *D. rubripilosa*.

Key words: Costa Rica, *Drymonia*, Gesneriaceae.

Drymonia Martius is one of the largest genera of Gesneriaceae in the Neotropics, with an estimated 140 species (Burtt & Wiehler, 1995). Traditionally, *Drymonia* has been separated from other genera in the tribe Episciae because of its basal poricidal dehiscence of the anthers. Other characters that stand out in the genus are the scandent habit of many of its species and the usually funnel-shaped corolla with spurred base and laciniate lobes.

The last and only revision of Costa Rican *Drymonia* was carried out by C. V. Morton in 1938 for Paul Standley's *Flora of Costa Rica*; Morton recognized 12 species of the genus. Since then, nomenclatural and taxonomic actions have yielded a total of 19 species for the country, making the genus the second largest in Costa Rica after *Columnea* (36 spp.) and before *Besleria* (15 spp.). Continuing efforts to document Costa Rica's flora through the *Manual de Plantas de Costa Rica* project have produced interesting specimens of a new species of *Drymonia* as proposed below.

Drymonia rubripilosa Kriebel, sp. nov. TYPE: Costa Rica. Limón: Faja Costeña de Limón, Asunción, 9°54′10″N, 83°10′20″W, 280 m, 15 Mar. 1995, *A. Estrada 399* (holotype, INB; isotypes, CR, MO). Figure 1.

Haec species *Drymoniae multiflorae* (Oersted ex Hanst.) Wiehler affinis, sed pedicellis minoribus, lamina et calycis lobatis majoribus, ramis, petiolis, pedicellis, corolla et ovario rubropilosis differt.

Semi-woody lianas; stems ± terete, sparsely to densely red-pilose apically, trichomes ca. 1 mm long, internodes 1–7.5 cm, 1.5–4 mm diam., with reddish flaky epidermis in older stems, frequently with adventitious roots. Leaves somewhat unequal in a pair; petiole 3–10 mm long, 0.75–1.25 mm diam., red-pilose; blade elliptic, oblong or obovate, 3–13 × 1.6–6 cm, chartaceous, apex acuminate, base acute to rounded, margin denticulate to serrate, veins pinnate, 3 to 6 on each side, prominent on lower side, usually red, glabrous adaxially, sparsely to moderately pilose abaxially, especially on the prominent veins, trichomes 0.75–1.3 mm long. Inflorescence of solitary, axillary flowers; peduncles lacking; bracts inconspicuous, linear, 2.5–5 mm long, red; pedicels 5–10 mm long, densely red-pilose. Flowers with calyx lobes divided almost to the base, 1.6–3 cm long, 3–15 mm wide at the base, the dorsal lobe somewhat smaller than the rest, lanceolate, the apex subulate, the margin deeply toothed to fimbriate, red to dark red; corolla 3–4 cm long, white with yellowish tinges inside the tube, with purple veins on the lobes adaxially, red-pilose especially on the distal exterior half of the tube dorsally, the latter ventricose toward the limb but then somewhat contracted, the spur ca. 5 mm long, glabrous, the limb somewhat 2-lipped, the lobes erose, the ventral lobe somewhat larger; stamens adnate to the corolla base, filaments connate above attachment to corolla, coiling after anthesis; disc a single posterior nectariferous gland; ovary 3–4 mm long at anthesis, red-pilose; style ca. 2 cm long. Fruit

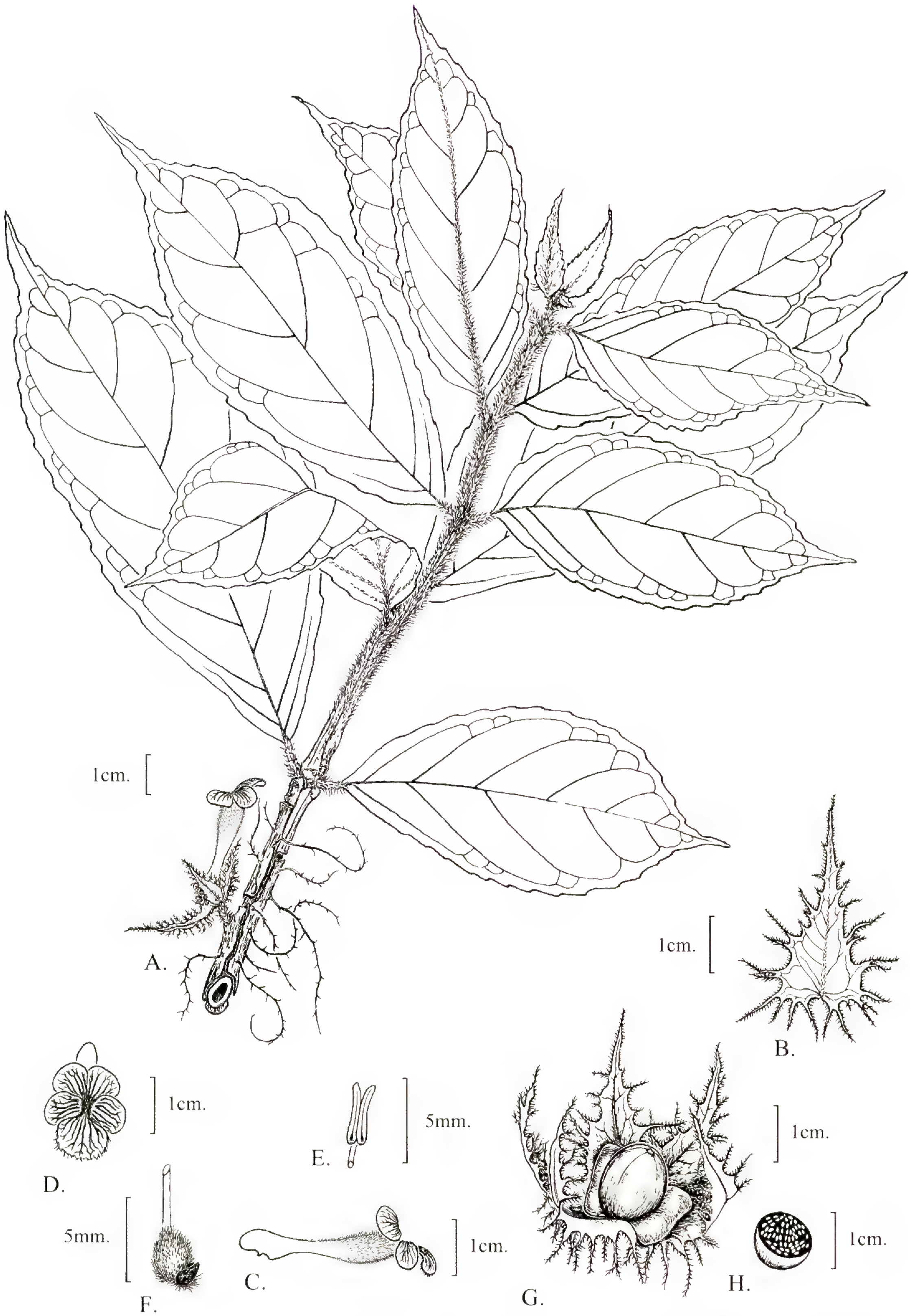

Figure 1. *Drymonia rubripilosa* Kriebel. —A. Habit. —B. Calyx lobe. —C. Corolla, lateral view. —D. Corolla, frontal view. —E. Anther thecae. —F. Ovary with dorsal gland. —G. Fruit. —H. Cross section of fleshy endocarp. (A, C–F, A. *Estrada 399*; B, G, H. *R. Kriebel et al. 3994*.).

a fleshy capsule persistent in the calyx, ovoid, 1.6 × 1.3 cm, purple, dehiscing by 2 valves that are light purple adaxially and that expose a mass of seeds within the persistent purple endocarp, the latter indehiscent; seeds 0.4–1 mm, oblong, beige, with inconspicuous longitudinal lines, not twisted.

Distribution and habitat. *Drymonia rubripilosa* is so far endemic to Costa Rica, where it is restricted to remaining forests in the northern (Boca Tapada region) and central (Barbilla and Braulio Carrillo National Parks, La Selva OTS Field Station) Caribbean lowlands, at 50–300 m, where it can be found climbing over small trees in the understory or in clearings. It is anticipated to appear in similar habitats in Nicaragua.

Phenology. Plants have been collected in flower from March to June and in fruit from June to September.

Drymonia rubripilosa can be distinguished by its scandent habit with numerous adventitious roots; sparse to dense red-pilose indument on distal branchlets and pedicels, the calyx, and the distal half of the corolla tubes and ovaries; short pedicels; and a conspicuously spurred corolla base and an essentially white corolla with purple-nerved lobes. It is most similar to and has been found to grow sympatrically with *D. multiflora* (Oersted ex Hanstein) Wiehler at the La Selva Field Station, Sarapiquí, Heredia, Costa Rica, where they were first distinguished in 1979 in the following extract from a "Key to the La Selva *Drymonia*" (B. Hammel, pers. obs.):

7. Plants red-brown pubescent; older stems with thin brown epidermis . . . . . D. "magenta calyx" [*D. rubripilosa*]
7′. Plants glabrous; stems green . . . . . D. "little magenta calyx" [*D. multiflora*]

Although the above key would apply to *Drymonia rubripilosa*, it would not completely discriminate *D. multiflora* because a few specimens of *D. multiflora* found in the Talamanca mountain range have reddish flaky epidermis on the stems. A more complete key to separate these sometimes confused species is presented below.

Key to Two *Drymonia* Species in Costa Rica

1a. Stem apices, petioles, pedicels, the distal half of corolla tubes and ovaries sparsely to densely red-pilose; leaf blades 3–13 × (1.2–)1.6–6 cm; pedicels 0.5–1 cm long; calyx lobes 1.6–3 cm long; epidermis of the stems usually reddish brown and flaky; corolla base conspicuously spurred; northern and central Caribbean lowlands in Costa Rica, 50–300 m elevation . . . . . *D. rubripilosa*
1b. Stem apices and petioles strigillose to white-sericeous; pedicels white-sericeous to white-pilose; corollas glabrous to white-pilose; ovary white-pubescent; leaf blades 1.4–6.7(–11.5) × 0.7–2(4) cm; pedicels 1–3.5 cm long; calyx lobes to 1.7 cm long; epidermis of the stems green, rarely reddish and flaky; corolla base usually not spurred; Caribbean slope of the Guanacaste, Tilarán, Central and Talamanca mountain ranges in Costa Rica, also in Mexico, Nicaragua, and Panama, (100–)700–1400 m elevation. . . . . *D. multiflora* (Oersted ex Hanstein) Wiehler

To recognize specimens and individuals of *Drymonia rubripilosa* in the field, it is also important to understand its sister species, *D. multiflora*. The latter seems to have two recognizable forms in Costa Rica. From the 41 specimens of *D. multiflora* examined at INB, 26 share the following characters: chartaceous, elliptic to lanceolate leaf blades to 6.7 cm with weakly impressed secondary veins and strigillose to glabrous surfaces abaxially, calyx lobes puberulent to glabrous, margins toothed, pedicels strigillose, and corollas mostly lacking a spur at the base, glabrous throughout, and to 2.5 cm long. Sixteen of these specimens are from the Talamanca mountain range in Costa Rica, and 10 are from the Tilarán mountain range, where both forms are sympatric. The second form is restricted to the northern cordilleras of Tilarán and Guanacaste in Costa Rica (represented by 15 specimens) and differs from the first in its membranous to somewhat translucent, elliptic-ovate to elliptic-obovate, usually larger leaves to 11.5 cm, with clearly impressed and moderately strigose secondary venation abaxially, calyx lobes sparsely to moderately pilose, calyx margins deeply toothed, pedicels strigillose to sparsely pilose, and corolla with a conspicuous spur at the base, sparsely pilose and longer to 3.1 cm. I believe the differences noted above are not worthy of specific status, but do reflect the population variability in *D. multiflora*.

Another vegetatively similar species to both taxa discussed above is *Drymonia folsomii* L. Skog, which, in Costa Rica, is restricted to Tapantí National Park and therefore is sympatric with *D. multiflora* but not with *D. rubripilosa*. *Drymonia folsomii* and *D. multiflora* are easily distinguished because the first has a subcampanulate corolla with a purple spot inside and white lobes (vs. a ± straight and funnel-shaped corolla with white tube sometimes tinged with yellow, with purple-veined corolla lobes in *D. multiflora*).

These three species (*Drymonia folsomii*, *D. multiflora*, and *D. rubripilosa*) share what seems to be a unique fruiting character for Costa Rican species of the genus. In these species, the bivalved, fleshy capsule opens to expose a fleshy, indehiscent endocarp surrounding the seeds (vs. a bivalved, fleshy capsule opening to expose a mass of funicles and

seeds without any trace of the endocarp). The reason for this could have to do with seed dispersion (probably by birds) in which the protected mass of seeds by the endocarp is consumed or transported as a whole rather than coming apart in smaller pieces.

Paratypes. COSTA RICA. **Alajuela:** San Carlos; 7 km NE de Boca Tapada, Laguna del Lagarto Lodge, *R. Kriebel 4977* (INB). **Limón:** Matina, Llanura de Santa Clara, Barbilla de Matina, *M. M. Chavarría & A. Solís 1003* (CR, INB). **Heredia:** Sarapiquí, P. N. Braulio Carrillo, Estación Magsasay, *E. Alcázar 102* (CR, INB); Sarapiquí, Puerto Viejo, E. B. La Selva, sendero circular cercano, *R. Kriebel et al. 3483* (INB); Sarapiquí, Puerto Viejo, E. B. La Selva, camino al lindero sur y devolviéndose por el sábalo esquina, *R. Kriebel et al. 3991* (INB).

Acknowledgments. I thank Barry Hammel for allowing me to use his key of La Selva *Drymonia*. Claudia Aragón is thanked for her illustration of the new species. I also thank Nelson Zamora and Reinaldo Aguilar, leaders of the Flora of La Selva project, for field companionship. Financial support for fieldwork in northern Costa Rica was provided by the Darwin Initiative.

Literature Cited

Burt, B. L. & H. Wiehler. 1995. Classification of the family Gesneriaceae. Gesneriana 1: 11.

Morton, C. V. 1938. Gesneriaceae. Pp. 1137–1187 *in* P. Standley (editor), Flora of Costa Rica. Publ. Field Mus. Nat. Hist., Bot. Ser. Vol. 18, part 4.

Validation of Names at Subspecific Rank in North American Campanulaceae

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Abstract. Thirteen combinations at subspecific rank are effected for North American Campanulaceae, in preparation for a forthcoming world checklist of the family. Twelve were recognized most recently at varietal rank within the same species to which they are here assigned: *Diastatea virgata* subsp. *ciliata* (McVaugh) Lammers, *Githopsis diffusa* subsp. *guadalupensis* (Morin) Lammers, *Heterotoma lobelioides* subsp. *glabra* (T. J. Ayers) Lammers, *Lobelia assurgens* subsp. *santa-clarae* (McVaugh) Lammers, *Lobelia berlandieri* subsp. *brachypoda* (A. Gray) Lammers, *Lobelia ehrenbergii* subsp. *gracilens* (A. Gray) Lammers, *Lobelia flexuosa* subsp. *intermedia* (Hemsley) Lammers, *Lobelia gruina* subsp. *pedunculariis* (McVaugh) Lammers, *Lobelia irasuensis* subsp. *fucata* (McVaugh) Lammers, *Lobelia irasuensis* subsp. *picta* (B. L. Robinson & Seaton) Lammers, *Palmerella debilis* subsp. *serrata* (A. Gray) Lammers, and *Triodanis perfoliata* subsp. *biflora* (Ruiz & Pavón) Lammers. *Downingia humilis* Greene has been recognized as a distinct species or subsumed without recognition into *D. pusilla* (G. Don ex A. DC.) Torrey; however, its pattern of variation makes its recognition as *Downingia pusilla* subsp. *humilis* (Greene) Lammers more appropriate.

Key words: Campanulaceae, *Diastatea*, *Downingia*, *Githopsis*, *Heterotoma*, *Lobelia*, *Palmerella*, *Triodanis*.

Work is drawing to a close on a checklist of the world's species of Campanulaceae Jussieu (sensu Lammers, 1998a, in press). In preparing this manuscript, numerous species were encountered that did not have a legitimate name in the genus and rank to which I thought they should be assigned. In some cases, this was due to problems of unrecognized priority; in others, it was because of revised generic circumscriptions. All these problems at specific rank were rectified in a series of six precursor papers (Lammers, 1995, 1998b, 1999a, 1999b, 2001; Serra et al., 1999).

There remain a few infraspecific taxa that merit recognition, but which similarly lack a legitimate name at the rank to which they should be assigned. In my opinion, the only infraspecific taxon that merits recognition is a group of conspecific populations that is not only morphologically distinguishable from other such groups, but is also geographically coherent in some fashion, typically allopatric or parapatric. Such groups are not as clearly demarcated as congeneric species, often showing intergradation in a zone of contact. Infraspecific groups that meet these criteria have consistently been ranked as subspecies in my research (e.g., Lammers, 1988, 1991, 1999b, 2004, 2005).

In order to maintain this consistency, 13 taxa (all native to North America) are here provided with names at subspecific rank: all meet my criteria outlined above. Of these, the single *Downingia* has been treated as a distinct species by some authors, but not distinguished at all by others. The rest have been treated in their most recent monographs at varietal rank in the species to which they are assigned here. As such, I basically am accepting the classifications in these monographs (cited as appropriate under each entry), with a simple change of rank. All of my statements regarding geographic distribution are derived from these same monographs.

Diastatea virgata subsp. **ciliata** (McVaugh) Lammers, stat. nov. Basionym: *Diastatea virgata* var. *ciliata* McVaugh, Bull. Torrey Bot. Club 67: 793. 1940. TYPE: Mexico. Guerrero: mountains above Iguala, limestone ledges, 24 Oct. 1900. *Pringle 8375* (holotype, GH; isotypes, F, G-DEL not seen, GOET not seen, ISC, NY, PH not seen, POM not seen, RM not seen, S not seen, US not seen).

Diastatea virgata Scheidweiler is endemic to southern Mexico; subspecies *virgata* is restricted to Oaxaca and Vera Cruz, while subspecies *ciliata* occurs farther north, in Michoacán, México, Morelos, and Guerrero (McVaugh, 1940a, 1943). They may be distinguished using McVaugh's (1940a, 1943) key to varieties.

Downingia pusilla subsp. **humilis** (Greene) Lammers, comb. et stat. nov. Basionym: *Bolelia humilis* Greene, Pittonia 2: 226. 1892. *Downingia humilis* (Greene) Rattan, Anal. Key West Coast Bot. (ed. 3): 47. 1898. TYPE: U.S.A. California: Sonoma Co., 1892, *Bioletti s.n.* (holotype, NDG-052519)

As circumscribed by McVaugh (1911, 1943) and Ayers (1993a), *Downingia pusilla* (G. Don ex A. DC.) Torrey is a species distributed amphitropically in the western United States (California) and southern South America (Chile and Argentina); these authors included *D. humilis* as a synonym, following Hoover (1940). Weiler (1962), however, found suites of morphological features by which the two could be distinguished. Weiler accorded these two groups specific rank, but did note the existence of intermediate specimens where their ranges approach one another in central Chile. This indicates to me that it is more appropriate to treat them as conspecific subspecies. They may be distinguished using the following key:

1a. Longest calyx lobe 1.4–8.3 mm long; mature hypanthium 13–35 mm long with tough rigid wall, any seed impressions obscure (Central Valley of California; Valparaíso, Colchagua, Ñuble, and Concepción provinces in north central Chile) . . . . . *D. pusilla* subsp. *humilis*

1b. Longest calyx lobe 2.5–11 mm long; mature hypanthium 5–12 mm long with thin papery wall, seed impressions obvious (Bío Bío and Valdivia provinces in south central Chile; Neuquen, Chubut, Río Negro, and Santa Cruz provinces in southern Argentina) . . . . . *D. pusilla* subsp. *pusilla*

Githopsis diffusa subsp. **guadalupensis** (Morin) Lammers, stat. nov. Basionym: *Githopsis diffusa* var. *guadalupensis* Morin, Syst. Bot. 8: 464. 1983. TYPE: Mexico. Baja California Norte: Guadalupe Island, 1857, *Palmer 53* (holotype, BM not seen; isotypes, GH, MO not seen, NO not seen, PH not seen, YU not seen).

Githopsis diffusa A. Gray is endemic to the western United States (California) and adjacent Mexico. Morin (1983, 1993) divided it into four subspecies (from north to south): *robusta* Morin (southern Cascade Mountains, northern Sierra Nevada, and North Coast ranges in California); *diffusa* (South Coast ranges in California to northern Baja California Norte in Mexico); *filicaulis* (Ewan) Morin (scattered localities in Riverside and San Diego Counties in California); and *candida* (Ewan) Morin. The last subspecies was divided by Morin into two allopatric varieties: *candida* (Ewan) Morin for populations in the Cuyamaca and Palomar Mountains of San Diego Co. in California, and *guadalupensis* Morin for populations on the Mexican island of Guadalupe. It is not clear why this approach was taken. Morin admits (1983: 451) that it is a very different case from her only other use of varietal rank in the genus (to denote "local populations scattered throughout the range of a species or subspecies"), but does not justify this variance from her own practice. Based on the morphological differences given in her key and the taxon's insular endemism, I find it more consistent to treat the plants on Guadalupe as a subspecies coordinate with the other four.

Heterotoma lobelioides subsp. **glabra** (T. J. Ayers) Lammers, stat. nov. Basionym: *Heterotoma lobelioides* var. *glabra* T. J. Ayers, Syst. Bot. 15: 311. 1990. TYPE: Mexico. San Luis Potosí: in mountains near Santa Maria del Rio, Aug. 1876, *Schaffner 736* (holotype, GH not seen; isotype, US not seen).

Heterotoma lobelioides Zuccarini is widely distributed in Mexico and Central America; subspecies *lobelioides* is widely distributed in the Sierra Madre del Sur of western Mexico, from Michoacán to Oaxaca, and on isolated volcanoes from Chiapas to Costa Rica, while subspecies *glabra* is parapatric on the north of that range, occurring in San Luis Potosí, as well as in Guerrero, Jalisco, and Mexico (Ayers, 1990). They may be distinguished using Ayers's (1990) key to varieties.

Lobelia assurgens subsp. **santa-clarae** (McVaugh) Lammers, stat. nov. Basionym: *Lobelia assurgens* var. *santa-clarae* McVaugh, N. Amer. Fl. 32A: 81. 1943. TYPE: Cuba, Trinidad Mts., Santa Clara (Las Villas), *Britton & Wilson 5331* (holotype, NY not seen).

Lobelia assurgens L. is endemic to the Greater Antilles; subspecies *assurgens* is endemic to Jamaica, while subspecies *santa-clarae* is found on Cuba and Hispaniola (McVaugh, 1943). They may be distinguished using McVaugh's (1943) key to varieties, after noting that he used the name *L. assurgens* var. *jamaicensis* Urban for what now must be known by the autonym *L. assurgens* subsp. *assurgens*.

Lobelia berlandieri subsp. **brachypoda** (A. Gray) Lammers, stat. nov. Basionym: *Lobelia cliffortiana* var. *brachypoda* A. Gray, Syn. Fl. N. Amer. 2(1): 7. 1878. *Lobelia brachypoda* (A. Gray) Small, Fl. S.E. U.S. 1147. 1903. *Lobelia berlandieri* var. *brachypoda* (A. Gray) McVaugh, Bartonia 23: 40. 1945. TYPE: U.S.A. Texas: "Collected in Expedition from Western Texas to El Paso, New Mexico," May–Oct. 1849, *Wright 419* (lectotype, designated by McVaugh, 1945a: 40, GH; isotype, NY).

McVaugh (1940b, 1943) originally treated *L. brachypoda* and *L. berlandieri* A. DC. as distinct species with parapatric ranges in northeastern Mexico and the adjacent U.S.A. (Texas). Subsequently (McVaugh, 1945a, 1951), he determined that a great number of specimens from their zone of contact were intermediate in morphology and treated the two as conspecific varieties. The situation he described is exactly the sort for which I prefer to use subspecific rank. The two may be distinguished with the following key:

1a. Fruiting pedicels (10–)12–25(–70) mm long, spreading, apex strongly incurved and capsule thereby facing stem; calyx lobes glabrous (Tamaulipas, Nueva León, and San Luis Potosí). . . . . *D. berlandieri* subsp. *berlandieri*.

1b. Fruiting pedicels 4–10(–12) mm long, strongly ascending, apex little or not at all incurved and capsule thereby erect; calyx lobes ciliate near apex (southern Texas to eastern Chihuahua and northern Tamaulipas) . . . . . *D. berlandieri* subsp. *brachypoda*.

Lobelia ehrenbergii subsp. **gracilens** (A. Gray) Lammers, stat. nov. Basionym: *Lobelia gracilens* A. Gray, Proc. Amer. Acad. Arts 21: 393. 1886. *Lobelia ehrenbergii* var. *gracilens* (A. Gray) McVaugh, Amer. Midl. Naturalist 24: 695. 1940. TYPE: Mexico. Southwestern Chihuahua, Aug.–Nov. 1885, *Palmer 360* (holotype, GH; isotypes, NY[2]).

Lobelia ehrenbergii Vatke is endemic to northern Mexico; subspecies *ehrenbergii* is found in Nuevo León, Tamaulipas, San Luis Potosí, and Hidalgo, while subspecies *gracilens* occurs disjunctly in western Chihuahua and adjacent Durango (McVaugh, 1943). They may be distinguished using McVaugh's (1943) key to varieties.

Lobelia flexuosa subsp. **intermedia** (Hemsley) Lammers, stat. nov. Basionym: *Heterotoma intermedia* Hemsley, Biol. Cent.-Amer., Bot. 2: 269. 1881. *Heterotoma cordifolia* var. *intermedia* (Hemsley) F. E. Wimmer, Pflanzenr. IV. 276b: 717. 1953. *Lobelia flexuosa* var. *intermedia* (Hemsley) T. J. Ayers, Syst. Bot. 15: 321. 1990. *Calcaratolobelia flexuosa* var. *intermedia* (Hemsley) Wilbur, Sida 17: 563. 1997. TYPE: Mexico. 1850, *Seemann 2051* (holotype, K not seen; isotype, BM not seen).

Lobelia flexuosa (C. Presl) A. DC. is endemic to western Mexico; subspecies *flexuosa* occurs in Nayarit, Jalisco, and Oaxaca, while subspecies *intermedia* is found north of that range in southwestern Durango (Ayers, 1990). They may be distinguished using Ayers's (1990) key to varieties.

Lobelia gruina subsp. **pedunculares** (McVaugh) Lammers, stat. nov. Basionym: *Lobelia gruina* var. *pedunculares* McVaugh, Amer. Midl. Naturalist 24: 687. 1940. TYPE: Mexico. Oaxaca: Sierra de San Felipe, 13 Oct. 1894, *Pringle 5688* (holotype, GH).

Lobelia gruina Cavanilles is endemic to Mexico; subspecies *gruina* is found from Durango and Nuevo León to Oaxaca, while subspecies *pedunculares* occurs in Guerrero and Oaxaca (McVaugh, 1943). They may be distinguished using McVaugh's (1943) key to varieties, after noting that he used the name *L. gruina* var. *conferta* Fernald for what now must be known by the autonym *L. gruina* subsp. *gruina*.

Lobelia irasuensis subsp. **fucata** (McVaugh) Lammers, stat. nov. Basionym: *Lobelia irasuensis* var. *fucata* McVaugh, Amer. Midl. Naturalist 24: 697. 1940. TYPE: Mexico. Durango: Dos Cajetes, ca. 30 mi. W of Durango, 3 Nov. 1896, *Palmer 817* (holotype, GH).

Lobelia irasuensis subsp. **picta** (B. L. Robinson & Seaton) Lammers, stat. nov. Basionym: *Lobelia picta* B. L. Robinson & Seaton, Proc. Amer. Acad. Arts 28: 112. 1893. *Lobelia irasuensis* var. *picta* (B. L. Robinson & Seaton) McVaugh, Amer. Midl. Naturalist 24: 697. 1940. TYPE: Mexico. México: Sierra de las Cruces, cold springy meadows, 1 Oct. 1892, *Pringle 4305* (holotype, GH; isotypes, MU, NY).

Lobelia irasuensis Planchon & Oersted is widespread in Mexico and Central America (McVaugh, 1943). Subspecies *irasuensis* is endemic to Central America, occurring in the mountains of Costa Rica and western Panama (Wilbur, 1977). The other two occur farther north, in Mexico; subspecies *picta* is endemic to the Eje Volcánica Transversal in the states of México and Michoacán, while subspecies *fucata* occurs in Aguascalientes, Durango, Guanajuato, Jalisco, Sinaloa, and Zacatecas (Rzedowski & Calderón de Rzedowski, 1997). They may be distinguished using McVaugh's (1943) key to varieties.

Palmerella debilis subsp. **serrata** (A. Gray) Lammers, stat. nov. Basionym: *Palmerella debilis* var. *serrata* A. Gray, in S. Watson, Bot. California 1: 620. 1876. *Lobelia rothrockii* Greene, Pittonia 1: 297. 1889; non *Lobelia serrata* Meyen, Reise 1: 300. 1834. *Laurentia debilis* var. *serrata* (A. Gray) McVaugh, Bull. Torrey Bot. Club 67: 144. 1940. *Lobelia dunnii* var. *serrata* (A. Gray) McVaugh, Bull. Torrey Bot. Club 67: 795. 1940. TYPE: U.S.A. California: Ojai Ck. valley, July 1875, *Rothrock 173* (holotype, GH; isotypes, F, NY).

Palmerella debilis A. Gray is endemic to the western United States (California) and adjacent Mexico; subspecies *debilis* is endemic to the Sierra Juárez and Sierra San Pedro Mártir of northern Baja California Norte in Mexico, while subspecies *serrata* occurs in the Outer South Coast Ranges, Transverse Ranges, and San Jacinto Mountains of southern California and the northern Sierra Juárez of northern Baja California Norte (McVaugh, 1940a, 1943; Wiggins, 1980; Ayers, 1993b). They may be distinguished using McVaugh's (1943) or Wiggins's (1980) key to varieties, after noting that they assigned this species to *Lobelia* under the homotypic name *L. dunnii* Greene.

Triodanis perfoliata subsp. **biflora** (Ruiz & Pavón) Lammers, stat. nov. Basionym: *Campanula biflora* Ruiz & Pavón, Fl. Peruv. 2: 55. 1799. *Specularia biflora* (Ruiz & Pavón) Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 2: 22. 1836. *Pentagonia biflora* (Ruiz & Pavón) Kuntze, Revis. Gen. Pl. 2: 381. 1891. *Legousia biflora* (Ruiz & Pavón) Britton, Mem. Torrey Bot. Club 5: 309. 1894. *Triodanis biflora* (Ruiz & Pavón) Greene, Man. Bot. San Francisco: 230. 1894. *Triodanis perfoliata* var. *biflora* (Ruiz & Pavón) T. R. Bradley, Brittonia 27: 114. 1975. TYPE: Peru, *Ruiz & Pavón s.n* (holotype, MA not seen; photo, F).

Bradley (1975) presented detailed data from experimental hybridization and morphometric studies, which supported the view that *Triodanis perfoliata* (L.) Nieuwland and *T. biflora* (Ruiz & Pavón) Greene represent two sets of populations that are incompletely isolated reproductively. As a result, plants of intermediate morphology are common in areas of sympatry. Although their geographic distributions overlap considerably (see McVaugh, 1945b, for details), it seems appropriate to recognize this variation pattern at the rank of subspecies. The two subspecies may be distinguished using McVaugh's (1945b) key to species.

Literature Cited

Ayers, T. J. 1990. Systematics of *Heterotoma* (Campanulaceae) and the evolution of nectar spurs in the New World Lobelioideae. Syst. Bot. 15: 296–327.

———. 1993a. *Downingia*. Pp. 460–462 *in* J. C. Hickman (editor), The Jepson Manual. Higher Plants of California. Univ. California Press, Berkeley.

———. 1993b. *Lobelia*. P. 465 *in* J. C. Hickman (editor), The Jepson Manual. Higher Plants of California. Univ. California Press, Berkeley.

Bradley, T. R. 1975. Hybidization between *Triodanis perfoliata* and *Triodanis biflora* (Campanulaceae). Brittonia 27: 110–111.

Hoover, R. F. 1940. Observations on Californian plants—I. Leafl. W. Bot. 2: 273–278.

Lammers, T. G. 1988. New taxa, new names, and new combinations in the Hawaiian Lobelioideae (Campanulaceae). Syst. Bot. 13: 496–508.

———. 1991. Systematics of *Clermontia*. Syst. Bot. Monogr. 32: 1–97.

———. 1995. Transfer of the southern African species of *Lightfootia*, nom. illeg., to *Wahlenbergia* (Campanulaceae, Campanuloideae). Taxon 44: 333–339.

———. 1998a. Nemacladoideae, a new subfamily of Campanulaceae. Novon 8: 36–37.

———. 1998b. New names and new combinations in Campanulaceae. Novon 8: 31–35.

———. 1999a. Nomenclatural consequences of the synonymization of *Hypsela reniformis* (Campanulaceae: Lobelioideae). Novon 9: 73–76.

———. 1999b. A new *Lobelia* from Mexico, with additional new combinations in world Campanulaceae. Novon 9: 381–389.

———. 2001. Further nomenclatural innovations in world Campanulaceae. Novon 11: 67–68.

———. 2004. Revision of *Lobelia* sect. *Homochilus* (Campanulaceae: Lobelioideae). Sida 21: 591–623.

———. 2005. Revision of *Delissea* (Campanulaceae–Lobelioideae). Syst. Bot. Monogr. 73: 1–75.

———. In press. Campanulaceae. *In:* J. W. Kadereit & C. Jeffrey (editors), The Families and Genera of Vascular Plants (series editor K. Kubitzki). Vol. VIII. Astrales. Springer, Heidelberg.

McVaugh, R. 1940a. A revision of "Laurentia" and allied genera in North America. Bull. Torrey Bot. Club 67: 778–798.

———. 1940b. A key to the North American species of *Lobelia* (sect. *Hemipogon*). Amer. Midl. Naturalist 24: 681–702.

———. 1941. A monograph on the genus *Downingia*. Mem. Torrey Bot. Club 19(4): 1–57.

———. 1943. Campanulales. Campanulaceae. Lobelioideae. N. Amer. Fl. 32A: 1–134.

———. 1945a. Notes on North American Campanulaceae. 5. *Lobelia berlandieri* and *Lobelia brachypoda*. Bartonia 23: 39–40.

———. 1945b. The genus *Triodanis* Rafinesque, and its relationships to *Specularia* and *Campanula*. Wrightia 1: 13–52.

———. 1951. Campanulaceae Juss. Pp. 331–366 *in* C. L. Lundell (editor), Flora of Texas, Vol. 3. Texas Research Foundation, Renner, Texas.

Morin, N. 1983. Systematics of *Githopsis* (Campanulaceae). Syst. Bot. 8: 436–468.

———. 1993. *Githopsis* Bluecup. Pp. 462, 464 *in* J. C. Hickman (editor), The Jepson Manual. Higher Plants of California. Univ. California Press, Berkeley.

Rzedowski, J. & G. Calderón de Rzedowski. 1997. Flora del Bajio y de Regiones Adyacentes. 58. Campanulaceae. Instituto de Ecología, Pátzcuaro, Mexico.

Serra, L., M. B. Crespo & T. G. Lammers. 1999. Wimmerella, *a new South African genus of Lobelioideae (Campanulaceae)*. Novon 9: 414–418.

Weiler, J. H, Jr. 1962. A Biosystematic Study of the Genus *Downingia*. Ph.D. Dissertation, University of California, Berkeley.

Wiggins, I. L. 1980. Flora of Baja California. Stanford Univ. Press, Stanford.

Wilbur, R. L. 1977. Flora of Panama, Campanulaceae. Ann. Missouri Bot. Gard. 63: 593–655.

A New Species of *Mimosa* (Fabaceae, Mimosoideae) from Madagascar

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Abstract. The new species *Mimosa manomboensis* Lefèvre & Labat (Fabaceae, Mimosoideae), known only from two populations in the Mikea Forest in southwestern Madagascar, is described, illustrated, and assigned a provisional IUCN conservation status of critically endangered.

Résumé. Une nouvelle espèce, *Mimosa manomboensis* Lefèvre & Labat (Fabaceae, Mimosoideae), connue seulement de deux populations de la Forêt de Mikea dans le Sud-Ouest de Madagascar, est décrite et illustrée. Un statut de conservation UICN provisoire, espèce en danger critique d'extinction, est proposé.

Key words: Fabaceae-Mimosoideae, Madagascar, *Mimosa*, taxonomy.

Mimosa L. is a large pantropical genus of about 500 species, with most of its diversity (about 460 species) occurring at low and middle elevations in tropical America (Barneby, 1991), but with some diversity in the Old World tropics, and with a small center of diversification in Madagascar (Du Puy et al., 2002). In the recent revision of the Leguminosae of Madagascar (Villiers, 2002), the genus *Mimosa* comprised 33 species, all endemic or near-endemic except *M. pigra* (also native to America, Africa, and islands in the Indian Ocean) and *M. pudica* (introduced probably from America and now a common pantropical weed). This study complemented previous treatments for tropical and southern Africa (Brenan, 1959; Brenan & Brummitt, 1970; Ross, 1975), in which only 5 native species and 8 introduced species (Lebrun & Stork, 1992) were recognized.

While conducting ethnobotanical research in the xerophytic Mikea Forest in southwestern Madagascar, the first author collected material that clearly represents a new species. Several months of fieldwork in the area around the village of Manombo revealed a single population of this distinctive *Mimosa*. A second collection comes from the northern part of Mikea Forest. Previous systematic sampling in the area by the second author and D. J. Du Puy did not yield any material of this localized species, nor was any found by J.-F. Villiers and D. J. Du Puy during their comprehensive examination of Mimosoideae from Madagascar at key herbaria, including BR, G, K, MO, P, TAN, TEF, and WAG. Further verification of collections at TAN and TEF, where Malagasy and visiting botanists have systematically deposited duplicate material during the past decade, as well as at K, MO, and G, did not uncover any recently collected material. The new species described here thus appears to be rare and to have a very limited distribution, confirming the first author's initial observations. Given the very distinctive nature of our novelty, it therefore seems preferable to publish this new species now (despite its only being known from two collections) so that botanists can continue to look for additional populations and the plant can be taken into consideration in conservation programs. It should be noted that the situation in the Manombo area is of great concern, with a high level of human pressure on the vegetation from clearing for cultivation and charcoal production.

Mimosa manomboensis Lefèvre & Labat, sp. nov. TYPE: Madagascar. Tuléar Prov.: Manombo, Fiherenamasay, 22°51′42″S, 43°26′59″E, ca. 50 m, 16 Feb. 2002 (fl, fr), *G. Lefèvre & V. Mily 20* (holotype, P(P00273020); isotypes, MO, TAN). Figure 1.

A Mimosa dumetaria Villiers lomento recto vel arcuato, angusto, 8 mm lato, apice apiculato atque dense aculeato, transversis segmentis 1-semina, replo dense aculeato in duobus axibus, seminibus atrobrunneis, planis, 1 mm crassis, areola magna (2 × 1.7 mm), pleurograma in uno sulco, luteola a seminibus colore distincta, differt.

Shrub up to 3 m tall, habit cernuous; twigs armed with short, sparse, uncinate prickles ca. 2 mm long, young shoots subglabrous to appressed pubescent; stipules present. *Leaves* bipinnate; *petiole* (0.8–)1–3 cm long, with prickles, finely pubescent; rachis (0.7–)1–3 cm long, grooved above, finely pubescent, with prickles beneath; pinnae (1)2 to 5 pairs per leaf, the axis of the pinnae 1–2.5 cm long, finely pubescent, sometimes with prickles beneath; stipels present; *leaflets* 6 to 19 pairs per pinna, the basal and apical pairs reduced, subsessile, petiolule up to

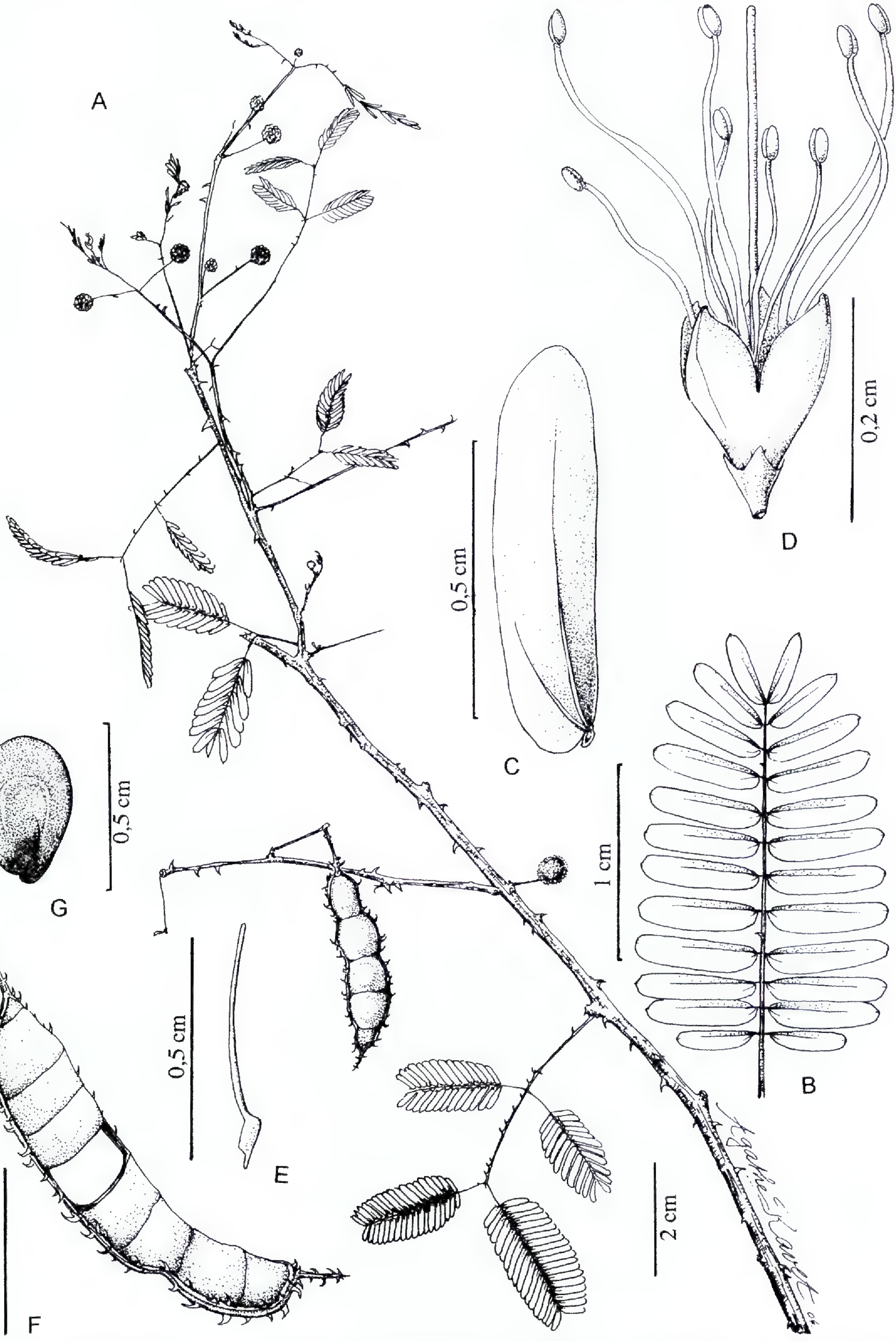

Figure 1. *Mimosa manomboensis* Lefèvre & Labat. —A. Flowering and fruiting shoot. —B. Pinna. —C. Leaflet. —D. Flower. —E. Gynoecium. —F. Lomentum. —G. Seed. (A–G drawn from *Lefèvre & Mily 20*, P.)

0.5 mm long, oblong, the proximal margin rounded-truncate at the base, the distal margin very shortly rounded attenuate, the apex rounded, glabrous on both surfaces, up to 7.5 × 1.9 mm; the midvein situated nearer to the distal margin, the lateral veins 1 or 2 visible, originated from the base in the proximal part of the leaflet. *Inflorescence* axillary, solitary or paired heads, ± 0.5 cm diam., peduncle 0.5–1 cm, sometimes with prickles. *Flowers* sessile; *calyx* 0.7 mm long, the lobes triangular, ciliate on the margin; *corolla* 2 mm long, white, the lobes with a small terminal green point; *stamens* 8, in 2 unequal cycles, 4.2–5 mm long; *ovary* 0.9 mm long, glabrous, with a stipe 0.3 mm long, the style 4.25 mm long. *Lomentum* green to yellow-brown, straight or curved, 3–5 cm long, ± 0.8 cm wide, segmented and separating transversely into 4 to 8 1-seeded indehiscent segments falling free of replum, the base attenuate, stipitate; stipe 0.6 cm long with prickles, the apex apiculate, densely prickly; the replum densely prickly with the prickles alternate in two lines, persistent; *seeds* oblong-ellipsoid, ca. 5 × 3 × 1 mm, very dark brown, strongly flattened, *areole* large (2 × 1.7 mm), central; *pleurogram* sunken, U-shaped, arms of equal length, yellow to white.

Habitat and distribution. In xerophytic forest, on sandy soils at an altitude of about 50–100 m, in the Mikea Forest, southwestern Madagascar.

Phenology. Flowering and fruiting in January to February.

Vernacular name. Roy (Masikoro dialect, *Ranairojaona 271*, in sched.), Roy haretsy (Masikoro dialect, *Lefèvre & Mily 20*, in sched.).

Local uses. A decoction of the roots and stems is used as a treatment of Fontanel's disease by the Masikoro people (pers. obs.).

Conservation status. The species appears to be a very localized narrow endemic, with only two small populations known from disturbed xerophytic forest, on sandy soils, in the Mikea Forest, giving it an extent of occurrence (EO) of about 800 km^2 and an area of occupancy (AO) of less than 20 km^2. A prelimary status of Endangered (EN B1abii B2abii) can be assigned to the species (following IUCN Red List criteria, IUCN, 2001).

Discussion. *Mimosa manomboensis* resembles and is most easily confused with *M. dumetaria* in general habit, the size and shape of the leaves, presence of prickles on the stem and the leaves, axillary inflorescences, and general aspect of the pods. Despite these similarities, *M. manomboensis* differs from *M. dumetaria* in its oblong, narrow (8 mm wide), straight to curved pod with a persistent densely prickly apical point, which fractures transversely into 1-seeded segments that fall away from the replum, as compared to the wider (12–15 mm), oblong-elliptic to oblong, straight pod with a deciduous non-prickly apical point of *M. dumetararia*, which does not break into 1-seeded segments, but rather has the central portion containing the seeds that falls away as a single unit. The new species also differs in its replum, which has dense prickles that form two lines instead of a replum with few prickles in a single line. *Mimosa manomboensis* has very dark brown, strongly flattened, 1 mm thick seeds, with a large areole (2 × 1.7 mm) and a sunken yellow to white pleurogram, instead of brown, less flattened, 1.4 mm thick seeds (incorrectly described as black in the original description (Villiers, 2002); the type specimens of *M. dumetaria* in P and TEF definitely have brown seeds), with a small areole (1 × 1 mm) and a pleurogram in the same color as the seed, not sunken but in the same plane as the surface of the seed.

Paratype. MADAGASCAR. Forêt de Mikea, Ambovoasay, Basibasy, Morombe, 22 10′13″S, 43 31′30″E, 100 m, 31 Jan.–01 Feb. 2000, *R. Ranairojaona 271* (MO not seen, P, TAN not seen).

To identify *M. manomboensis* using Villiers's (2002: 170–172) key, the following modification is proposed:

Replace the couplet 10 by the following new one; insert a new couplet 10* between 10 and 11 as follows:

10. Inflorescence axillary, consisting of solitary or paired heads; fruit less than 1.5 cm wide; petiole less than 3 cm long; pinnae typically with more than 11 pairs of leaflets 10*
Inflorescence terminal or axillary, consisting of a panicle of heads; fruit more than 1.5 cm wide; petiole more than 3 cm long, pinnae with up to 11 pairs of leaflets. 11

10*. Lomentum 8 mm wide, with a persistent densely prickly apiculate apex, fracturing transversely into 1-seeded segments that fall away from the replum; seeds very dark brown, strongly flattened, 1 mm thick, with a large areole (2 × 1.7 mm), and a yellow to white sunken pleurogram . . . . *M. manomboensis*
Lomentum 12–15 mm wide, with a deciduous non-prickly apex, not breaking into separate segments, the central portion falling away as a single unit; seeds brown, not strongly flattened, 1.4 mm thick, with a small areole (1 × 1 mm) and a brown pleurogram that is not sunken and is the same color as the seed. . . . . *M. dumetaria*

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Literature Cited

Barneby, R. C. 1991. Sensitivae Censitae. A description of the genus *Mimosa* L. (Mimosaceae) in the New World. Mem. New York Bot. Gard. 65: 1–835.

Brenan, J. P. M. 1959. Leguminosae (part 1). Mimosoideae. Pp. 1–173 *in* E. Milne-Redhead & R. M. Polhill (editors), Flora of Tropical East Africa. Crown Agents for Oversea Governments and Administration, London.

——— & R. K. Brummitt. 1970. Leguminosae. Pp. 7–138 *in* J. K. Brennan (editor), Flora Zambesiaca, Vol. 3(1). Kew Publishing and Flora Zambesiaca Managing Committee, London.

Du Puy, D. J., J.-N. Labat, R. Rabevohitra, J.-F. Villiers, J. Bosser & J. Moat. 2002. The Leguminosae of Madagascar. Royal Botanic Gardens, Kew.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, Cambridge.

Lebrun, J. P. & A. L. Stork. 1992. Enumération des Plantes à Fleurs d'Afrique Tropicale. Vol. II, Chrysobalanaceae à Apiaceae. Conservatoire et Jardin botaniques de la Ville de Genève, Genève.

Ross, J. H. 1975. Fabaceae. Mimosoideae. Pp. 2–159 *in* J. H. Ross (editor), Flora of Southern Africa, Vol. 16(1). Government Printer, Pretoria, South Africa.

Villiers, J.-F. 2002. Tribe Mimoseae. Pp. 159–223 *in* D. J. DuPuy, J.-N. Labat, R. Rabevohitra, J.-F. Villiers, J. Bosser & J. Moat. The Leguminosae of Madagascar. Royal Botanic Gardens, Kew.

A New Species of *Caesalpinia* (Leguminosae, Caesalpinioideae) from China

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Abstract. A new species of *Caesalpinia* (Leguminosae, Caesalpinioideae) from China is described and illustrated as *Caesalpinia yunnanensis* S. J. Li, D. X. Zhang & Z. Y. Chen. The new taxon is known only from the type locality in Xishuangbanna, Yunnan, China, and resembles *C. crista* L., a species widely distributed in pantropical regions.

Key words: Caesalpinia, Caesalpinioideae, China, Fabaceae, Leguminosae, Yunnan.

Caesalpinia L. (Leguminosae, Caesalpinioideae), as traditionally circumscribed, includes 120 to 130 species with a pantropical distribution (Lewis, 1998; Vidal et al., 1980). There are 19 species recognized in China (Chen, 1988; Li et al., 2001). During a comprehensive taxonomic revision of the genus in China, a new species, *C. yunnanensis*, has been discovered. It shows morphological similarities to *C. crista* L., a species widely distributed in pantropical regions, although there are also substantial differences between them.

Caesalpinia yunnanensis S. J. Li, D. X. Zhang & Z. Y. Chen, sp. nov. TYPE: China. Yunnan: Xishuangbanna, 600 m, *T. P. Zhu (Zhu Tai-Ping) 139* (holotype, KUN). Figures 1, 2A, B.

Folia biparipinnata; laminae rugatae, ovato-lanceolatae vel oblongo-lanceolatae; legumina lobata, striis transversiis vel longitudinalibus distinctis, non reticulatis prominulis; cocci 5.0–7.0 × 2.8–3.5 cm; flores non vidi.

Lianas; branchlets set with recurved prickles to ca. 2 mm long; stipules lacking. Leaf rachis 20 cm long, with recurved prickles at the base of the pinnae and on the rachis between the pinnae; pinnae in 3 pairs; leaflets opposite, in 2 pairs, petiolule 3–4 mm; blade coriaceous, wrinkled, 6.0–9.0 × 2.5–3.0 cm, ovate-lanceolate, aequilateral, base slightly rounded or sometimes widely cuneate, apex obtusely acuminate, margin incurved abaxially, upper blade surface shining, lower surface dull. Flowers not seen; receptacle remnant ca. 3 mm wide; pod dehiscent, oblong to elliptic, slightly asymmetric, 5.0–7.0 × 2.8–3.5 cm, base widely cuneate, apex obtuse, slanting with a ca. 2 mm long beak.

Venation brochidodromous pinnate. Primary vein stout (3.0%), straight. Secondary veins 15 to 20 pairs; angle of divergence 75°–85°; brochidodromous; looping arches irregular in shape; enclosed by tertiary and quaternary vein arches; intersecondary veins common, simple or sometimes composite. Tertiary reticulation. Quaternary veins anastomosing to form imperfect areoles. Marginal ultimate veins looped. FEVs (free-ending ultimate veins) 1-branched or rarely unbranched. (Figure 2A, B).

Phenology. Fruiting specimens collected in October.

Distribution. Known only from Xishuangbanna, Yunnan, China.

Caesalpinia yunnanensis resembles *C. crista*, and they are distinguished easily from the other species of the genus by the following characters: coriaceous leaflets, lacking stipule, armed branchlets and armed leaf rachis, unarmed and wingless pods. *Caesalpinia yunnanensis* and *C. crista* can be distinguished easily by the shape and surface of the fruits and by the leaf venation characters (Table 1).

Paratypes. CHINA. **Yunnan:** Xishuangbanna, *Y. H. Li (Li Yan-Hui) 5349* (KUN); Manting, 610 m, *Z. N. Chen (Chen Zi-Niu) 66* (IBSC).

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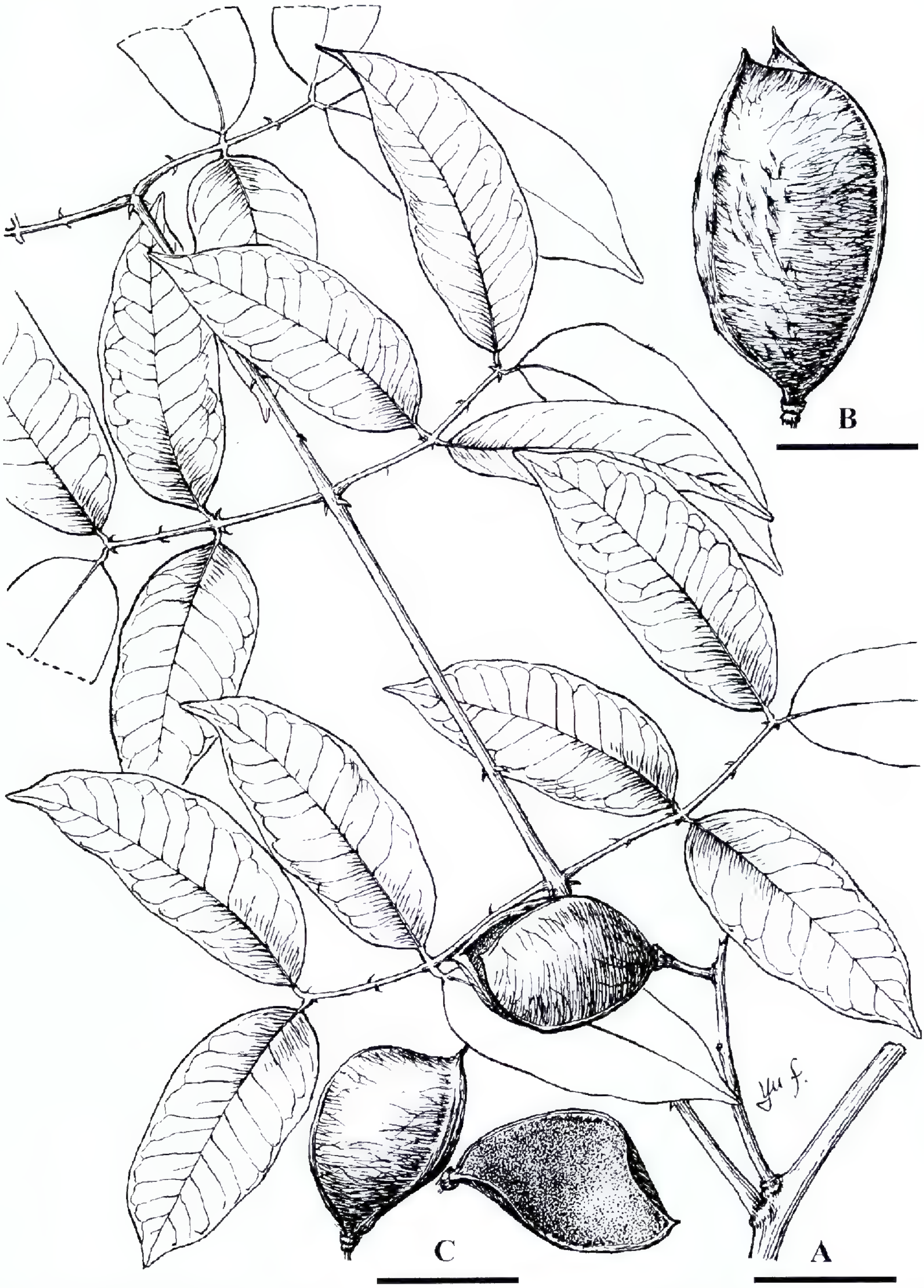

Figure 1. *Caesalpinia yunnanensis*. —A. Branchlet with mature fruits. —B. A large fruit. —C. Coccus of the fruit. Scale bars = 37.5 mm. A, C drawn from *T. P. Zhu 139* (KUN); B drawn from *Y. H. Li 5349* (KUN).

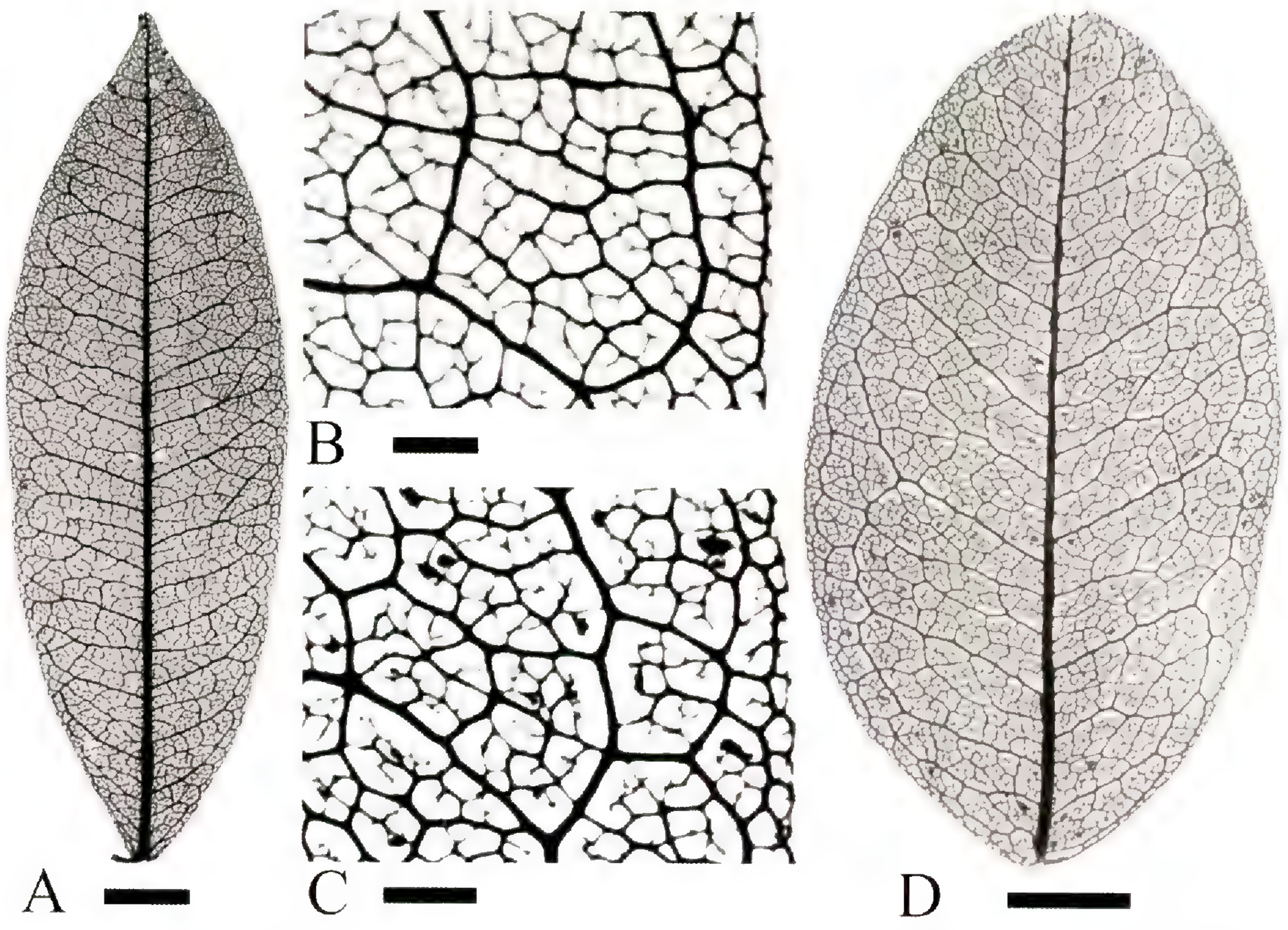

Figure 2. A, B. Leaf venation of *Caesalpinia yunnanensis* (based on *T. P. Zhu 139*, KUN). —A. Whole leaflet showing its venation, scale bar = 10 mm. —B. Marginal veins, scale bar = 1 mm. C, D. Leaf venation of *C. crista* (based on *C. L. Tso 21485*, IBSC). —C. Marginal veins, scale bar = 1 mm. —D. Whole leaflet showing its venation, scale bar = 10 mm.

Table 1. Comparison of *Caesalpinia yunnanensis* and *C. crista*.

Species	Pod	Leaf blade	Leaf venation*
C. yunnanensis	dehiscent; slightly asymmetrical; without a wing; surface wrinkled; venation not prominent	wrinkled, ovate-lanceolate, 6.0–9.0 × 2.5–3.0 cm	primary vein stout, size** = 3.0%; secondary veins 15 to 20 pairs, angle of divergence 75 –85
*C. crista****	indehiscent; strongly asymmetrical or subsymmetrical; with narrow wing ca. 0.4 mm wide; surface with prominent venation	flat, ovate, or elliptic, 2.0–10.0 × 1.0–5.0 cm	primary vein moderately thick, size = 1.8%; secondary veins 7 to 12 pairs, angle of divergence 65 –75 . (Fig. 2C, D)

* Voucher specimens: *Caesalpinia yunnanesis* from the type (KUN), and *C. crista* from *C. L. Tso 21485* (IBSC).
** Size = venation width to leaf blade width (Dilcher, 1974).
*** Floristic description from Hattink (1974), Chen (1988), and Hou et al. (1996).

illustration. We are also indebted to KUN for loan of the specimens.

Literature Cited

Chen, T. 1988. Leguminosae, Caesalpinioideae. *In*: Flora Reipublicae Popularis Sinicae, Tomus 39. Science Press, Beijing.

Dilcher, D. L. 1974. Approaches to the identification of angiosperm leaf remains. Bot. Rev. 40: 1–157.

Hattink, T. T. 1974. A revision of Malesian *Caesalpinia*, including *Mezoneuron* (Leguminosae–Caesalpiniaceae). Reinwardtia 9: 1–69.

Hou, D., K. Larsen & S. S. Larsen. 1996. Caesalpiniaceae. Pp. 535–555 *in*: C. Kalkman, D. Hou, K. Larsen, S. S. Larsen, J. E. Laferriere & B. E. E. Duyfjes (editors), Flora Malesiana, Series I, Vol. 12, Part 2. Rijksherbarium, Leiden.

Lewis, G. P. 1998. *Caesalpinia*: A revision of the *Poincianella–Erythorstemon* group. Royal Botanic Gardens, Kew.

Li, S. J., D. X. Zhang & Z. Y. Chen. 2001. A species of *Caesalpinia* L. (Leguminosae) new to China. Guihaia 21: 165.

Vidal, J. E., K. Larsen & S. S. Larsen. 1980. Leguminosae: Caesalpinioideae. *In:* Flore du Cambodge, du Laos, et du Viêt-Nam, Vol. 18. Museum National d'Histoire Naturelle, Paris.

Bouvardia viticella (Rubiaceae, Spermacoceae), a New Species from the Mixed Temperate Forest of Mexico

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Abstract. *Bouvardia viticella* Lorea-Hernández & Lozada-Pérez is described and illustrated. This new species is distinguished by its scandent habit, main stem thick suberose at base, plinerved leaves, white flowers, short corolla tube evenly pubescent within, and corolla lobes densely papillose adaxially. Partial inflorescences and exserted anthers in short-styled flowers place it in *Bouvardia* Salisbury subg. *Bouvardiastrum* Schlechtendal, but its relationships below this level are not so clear.

Key words: *Bouvardia*, Mexico, Rubiaceae, Spermacoceae.

During the survey of a well-preserved tract of mixed temperate forest in the Sierra Madre del Sur in Guerrero, Mexico, an abundant rubiaceous vine was collected that was not assignable to any of the species known for the family in the region. Soon after, it was confirmed to be a new species. Features including the presence of raphides, valvate corolla lobes, a two-celled ovary with several ovules per locule, capsular fruit, and flat, round, winged seeds indicated that the plant belonged in subfamily Rubioideae, specifically in the tribe Spermacoceae. Genera of the Rubioideae with winged seeds, such as *Bouvardia* Salisbury, *Heterophyllaea* Hooker f., *Hindsia* Bentham ex Lindley, *Manettia* Mutis ex L., and *Neohymenopogon* Bennet, were up to few years ago considered to be in the tribe Hedyotideae (sensu Bremekamp, 1966). There is now, however, enough support to subsume this tribe in the Spermacoceae (Bremer & Manen, 2000). Considering other characters, together with the ones mentioned above, we decided to place the new taxon in the genus *Bouvardia*.

Bouvardia viticella Lorea-Hernández & Lozada-Pérez, sp. nov. TYPE: Mexico. Guerrero: mpio. Atoyac de Álvarez, 1 km al oeste de El Molote, 1700 m, 10 Dec. 2001 (fl), *L. Lozada 2492* (holotype, FCME; isotypes, ENCB, FCME, MEXU, MO, XAL). Figure 1.

Plantae scandentes; caule principali basaliter suberoso; ramulis glabris; stipulis vaginantibus, intrapetiolaribus, scariosis, glabris, mucronatis; foliis lanceolatis, supra et infra glabris, pli vel subplinervibus; inflorescentiis cymosis vel thyrsoideis, bracteatis; floribus heterostylis, corollis albis, hypocrateriformibus, tubo extus glabro, intus (praeter basim) dense tomentoso, fauce dense pilosa, lobis ovatis, mucronatis, extus glabris, intus dense papillosis; hypanthio glabro; ovulis 9 ad 12 in quoque loculo; seminibus discoideis, alatis, ala plus minusve reticulata.

Climbing herbaceous or suffrutescent plants, up to 6(–10) m tall; main stem thick suberous in its proximal section, irregularly ridged, 1–2.5 cm diam.; leafy branches up to 2 mm diam., glabrous, slightly fissured with age. Leaves opposite, stipules sheathing, intrapetiolar, scarious, glabrous, 1–2(–2.5) mm long, free part (0.3–)0.5–0.7(–1) mm long, stipular mucron 0.5–1.2 mm long, digitiform, apex seeming glandular, petiole (1.5–)2–3.5(–5.5) × 0.3–0.5 mm, flat above, rounded below; leaf blade (1.5–)4–7(–8) × (0.5–)1.5–2.5(–3) cm, lanceolate, apex long acuminate, base rounded, glabrous on both surfaces; midvein flat or slightly sunken above toward base, glabrous, elevated below, glabrous, secondary veins 2 to 3 pairs, plinerved or subplinerved (basal or suprabasal acrodromous), flat and glabrous above, slightly elevated below, glabrous, tertiary veins reticulate, inconspicuous. Inflorescence (2–)4.5–11 cm long, terminal, cymose, simple or doubly thyrsoid, bracteate, bracts foliaceous at the base of proximal divisions, strongly reduced toward the distal branches of the inflorescence, peduncle (1.3–)2.5–4.5 cm long, pedicel (1.5–)2–4 mm long. Flowers tetramerous, heterostylous, white, with an unpleasant smell, long-styled (pin) flowers slightly smaller than short-styled (thrum) flowers, calyx lobes 1.5–3 × 0.5–0.7 mm, sometimes heteromorphic; corolla shortly salverform, tube (2–)3–3.8 × 1.5–1.7 mm, glabrous outside,

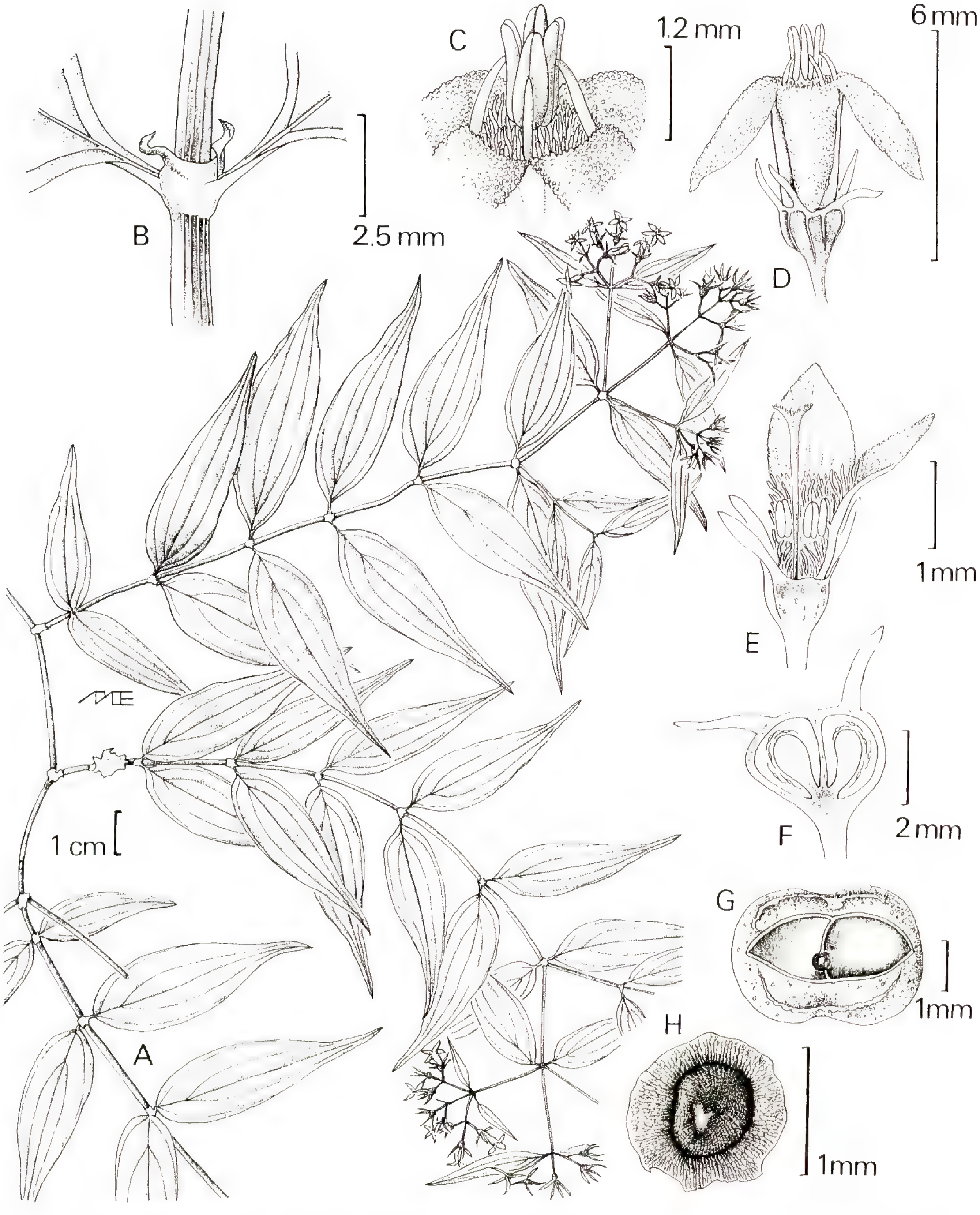

Figure 1. *Bouvardia viticella* Lorea-Hernández & Lozada-Pérez. —A. Plant habit. —B. Detail of stipules. —C. Detail of connivent anthers in short-styled flower. —D. Short-styled flower. —E. Long-styled flower with part of the corolla removed. —F. Longitudinal section view of the hypanthium. —G. Apical view of the capsule. —H. Seed. Drawn from the type, *L. Lozada 2192* (FCME), except D, from *L. Lozada 2375* (XAL).

densely tomentose inside, except at base, throat densely pilose, corolla lobes 3–4 × 2.3–2.8 mm, ovate, mucronate, valvate in bud, first spreading at anthesis, finally reflexed and revolute, glabrous outside, densely papillose inside, stamens in long-styled flowers included, filaments 0.2–0.3 mm long, glabrous, inserted below the corolla throat, anthers 0.8–1.2 mm long, narrowly oblong, style 3.5–4.5 mm long, stamens in short-styled flowers exserted, filaments 1.3–2 mm long, glabrous, inserted at the

corolla throat, anthers 1.2–1.4 mm long, narrowly oblong, connivent in anthesis, later separating, style 2.2–2.5 mm long, stigma 0.5–0.7 mm long, bifid, the branches pubescent adaxially all their length, hypanthium 1 × 1.2–1.8 mm, hemielliptic in outline, slightly compressed, glabrous, ovary bilocular, placentae basifixed on septum, ovules 9 to 12 per locule. Fruit 2.8–3.2 × 3.8–4.5 mm, capsular, loculicidal, sepals persistent, not accrescent, pedicel 2.5–4 mm long. Seeds depressed, discoid, 1.2–1.4 mm diam., dark brown, uniformly and ± evenly winged around margin, finely reticulate, reticulum slightly elevated, wing ca. 0.3 mm wide, ± finely reticulate, neither dissected nor fringed.

Distribution. Known only from the type locality, from central Sierra Madre del Sur in Guerrero, Mexico. El Molote lies on the ranges that face the Pacific Ocean, about 6 km due south of Cerro Teotepec (to 3550 m), and 10 km west of Cerro Tlacotepec (to 3300 m). The region is characterized by very steep terrains derived from intrusive igneous rocks (a mixture of granite and granodiorite).

Habitat. Mixed temperate forest, dominated by species in the genera *Alchornea* Swartz, *Alfaroa* Standley, *Billia* Peyritsch, *Dendropanax* Decaisne & Planchon, *Licaria* Aublet, *Magnolia* L., *Mocinnodaphne* Lorea-Hernández, *Persea* Miller, *Pouteria* Aublet, and *Quercus* L., among others, ca. 1600–1800 m elevation. *Dioscorea convolvulacea* Schlechtendal & Chamisso and *Mandevilla tubiflora* (M. Martens & Galeotti) Woodson are species of the same ecological guild that share space with *B. viticella*.

Phenology. Flowering in September and December, fruiting in December.

The complete, adaxially pubescent stigmatic branches, loculicidal capsules, as well as the entire wing of the seeds found in the new species substantiate its placement in *Bouvardia* (Andersson & Persson, 1991; Blackwell, 1968). Although the climbing habit suggests some relationship with *Manettia*, the scandent rather than twining growth form, which is typical for this genus, indicates a differing taxonomic affinity. Moreover, *Manettia* has stigmatic branches just distally pubescent on adaxial surfaces, septicidal capsules, and seeds with their margin erose to fimbriate (Andersson & Persson, 1991; Wernham, 1918). The feature of 4-merous flowers present in the new species indicates a lack of relationship with *Heterophyllaea* and *Hindsia* (both with 5-merous flowers), the other genera with discoid, winged seeds of the Spermacoceae in the Neotropics. The specific epithet of the new taxon alludes to the scandent habit of the plant, which appears like a small vine.

We are aware of the existence of a number of species in *Hedyotis* L., namely the *H. latifolia* (M. Martens & Galeotti) Walpers group (Terrell, 1991, 1996), that present a seed morphology (particularly in *H. galeottii* (M. Martens) Terrell & Lorence) similar to that found in the new species. We suspect, however, that most species in the *H. latifolia* group may be closely related to *Bouvardia* instead. In fact, *Hedyotis xestosperma* (B. L. Robinson & Greenman) Terrell & S. D. Koch, formerly in that group, has been moved to *Bouvardia* (Terrell & Koch, 1994). Although molecular studies suggest that *Hedyotis* is polyphyletic, no species of the *H. latifolia* group has been considered in the recent molecular surveys involving the tribe Spermacoceae (Andersson & Rova, 1999; Bremer & Manen, 2000; Andersson et al., 2002). Thus, for the moment there is no additional support, beyond morphology, for the placement of the new species in *Bouvardia*, rather than elsewhere within the Spermacoceae.

Considering the structure of the inflorescence (partial inflorescences with 3 or more flowers), and that the short-styled flowers have exserted anthers, *Bouvardia viticella* would belong in the subgenus *Bouvardiastrum* Schlechtendal (Blackwell, 1968). Possible relationships below this level are not so clear, because the 3- to 5-plinerved species in this subgenus (namely, *Bouvardia oaxacana* Standley, *B. quinquenervata* Standley, and *B. rekoi* Standley) have corollas tinted in some shade of red, generally much longer corolla tubes (usually 6–15 mm) that are partially villous in the lower half within, and corolla lobes glabrous or glabrescent adaxially; this is contrary to what we see in *B. viticella* (white corollas with tube averaging 3 mm long, evenly pubescent inside, extending its pubescence to the corolla lobes). This new species also shows affinity to *B. macdougallii* Lorence from Oaxaca (Lorence, 1994), as both species share the feature of a short, white, internally pubescent corolla. Vegetative morphology, however, suggests a relationship with *B. rekoi*, based on the shape of the leaves (lanceolate, apex long acuminate, base rounded), pattern and appearance of secondary veins, and the morphology of stipules (sheathing, intrapetiolar, scarious when old). In addition, it is interesting to mention that one collection of *B. rekoi* (*Koch et al. 79524*, XAL) is recorded as being a "scandent shrub, up to 3 m tall," a similar growth habit as *B. viticella*.

Paratypes. MEXICO. **Guerrero:** mpio. Atoyac de Álvarez, km 2 del camino El Molote–El Edén, *L. Lozada 2041* (FCME); 1.8 km al oeste de El Molote, *L. Lozada 2375* (ENCB, FCME, MEXU, MO, XAL), *2378* (ENCB, FCME, MEXU, MO, XAL); huerta de café al oeste de El Molote, *L. Lozada 2486* (ENCB, FCME, MEXU, MO, XAL); a 300 m de El Molote, *E. León 121* (FCME, XAL).

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Literature Cited

Andersson, L. & C. Persson. 1991. Circumscription of the tribe Cinchoneae (Rubiaceae)—A cladistic approach. Pl. Syst. Evol. 178: 65–94.

——— & J. H. E. Rova. 1999. The *rps* 16 intron and the phylogeny of the Rubioideae (Rubiaceae). Pl. Syst. Evol. 214: 161–186.

———, ——— & F. Alzate. 2002. Relationships, circumscription, and biogeography of *Arcytophyllum* (Rubiaceae) based on evidence from cpDNA. Brittonia 54: 40–49.

Blackwell, W. H., Jr. 1968. Revision of *Bouvardia* (Rubiaceae). Ann. Missouri Bot. Gard. 55: 1–30.

Bremekamp, C. E. B. 1966. Remarks on the position, the delimitation and the subdivision of the Rubiaceae. Acta Bot. Neerl. 15: 1–33.

Bremer, B. & J.-F. Manen. 2000. Phylogeny and classification of the subfamily Rubioideae (Rubiaceae). Pl. Syst. Evol. 225: 43–72.

Lorence, D. H. 1994. New species in Mexican and Mesoamerican Rubiaceae. Novon 4: 119–136.

Terrell, E. E. 1991. Overview and annotated list of North American species of *Hedyotis*, *Houstonia*, *Oldenlandia* (Rubiaceae), and related genera. Phytologia 71: 212–243.

———. 1996. Revision of *Houstonia* (Rubiaceae–Hedyotideae). Syst. Bot. Monogr. 48: 1–118.

——— & S. D. Koch. 1994. A new species of *Bouvardia* (Rubiaceae) from Mexico, and transfer of *Hedyotis xestosperma* to *Bouvardia*. Novon 4: 179–182.

Wernham, H. F. 1918. The genus *Manettia*. J. Bot. 57(Suppl.): 1–16.

Passiflora sandrae (Passifloraceae), a New Species from Panama

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Abstract. The new species *Passiflora sandrae* from Panama is described and illustrated from living and herbarium material. It is placed in subgenus *Decaloba* supersection *Decaloba* on the basis of the plicate operculum, cernuous shoot tip, transversely sulcate testa, and variegated bilobed leaves. This vine previously has been confused with *P. biflora*.

Key words: Mesoamerica, Panama, *Passiflora*, Sandra Knapp.

While preparing a revision of the Passifloraceae of Mesoamerica, it became clear that a relatively common Panamanian species of passionflower had never been described. Despite its presence on Barro Colorado Island and the existence of specimens dating from the early part of the 20th century, only now is it shown to be new, thanks particularly to careful collections and field notes made by Sandra Knapp and James Mallet.

Passiflora sandrae J. MacDougal, sp. nov. TYPE: Panama. Panamá: foothills and summit of Cerro Caracoral, near La Mesa N of El Valle de Anton, cloud forest and elfin forest, 800–1100 m, 12 Sep. 1981 (bud, fl, imm fr), *S. Knapp & J. Mallet 1156* (holotype, MO-3034806). Figures 1 and 2.

Haec species *Passiflorae biflorae* Lamarck similis, sed ab ea prophyllo solitario ad gemmam axillarem vegetativam posito, lamina foliari secus costam pallide vittata, nectariis laminaribus ocellatis marginibus hebetatis atque bracteis obscuris distinguitur.

Small to medium non-woody vine, minutely puberulent to puberulent throughout, except the laminas adaxially glabrous, and the stem sometimes glabrescent below; stems ca. 5-angled and strongly grooved-striate, often purple or reddish purple, the shoot tip cernuous; prophyll of the vegetative bud 1, 0.8–2 mm long, narrowly lanceolate to linear-triangular. Stipules 1.5–3.5 × 0.15–0.35 mm, linear-narrowly triangular, subfalcate, dark red to purple; petioles eglandular; laminas (2.3–)3.5–6.5 cm long along central vein, 4–9.5 cm wide, variegated adaxially along the lateral veins and sometimes on the center vein (rarely not variegated), often lustrous, abaxially often flushed red-purple, this often very dark on young leaves, in outline obovate to very widely obovate (sometimes shallowly obdeltate or obtriangular) in outline, 2-lobed (rarely sub-3-lobed) 1/4 to 1/2 the distance to the base (or rarely slightly deeper than 1/2), the apices of the lateral lobes very variable, mostly acute to obtuse, but occasionally acuminate, rounded, or even truncate, the central lobe obsolete (rarely present as an obtuse cusp), the angle between the lateral lobes (28°–)40°–55°(–67°), the ratio of laminar width to (central vein) length (0.9–)1.1–2(–3.2); laminar margin entire, minutely ciliolate with trichomes 0.15–0.25 mm long; leaves on new shoots near base of established plant ("runners") very deeply bilobed, dark red-purple abaxially; seedling leaves very shallowly 3-lobed, the lobes rounded to truncate, subequal; juvenile leaves 3-lobed, the lobes rounded to truncate, the central lobe shorter; laminar nectaries borne between the main veins, usually edged with dark purple and thus ocellate, with 2 to 4 conspicuously enlarged nectaries at junction of main veins. Peduncles (1)2 per node, 0.8–2(–2.8) cm long not including floral stipe, uniflorous; bracts 0.8–2.9 × 0.08–0.25 mm, setaceous, linear-triangular, at least 2 of the 3 bracts at or within 2 mm of the apex of the peduncle, purple, not necrotic. Buds characteristically much constricted distal to hypanthium ("shape of Gemini space capsule"), pale green-yellow to nearly white. Flowers oriented about 45°–65° below the horizontal plane at anthesis, with faint sweet-waxy odor or like cut ripe pumpkin, green-white to white, the corona basally yellow-green, distally pale green, green-yellow, or most commonly light yellow; floral stipe 2–5.5 mm (to 6.5 mm in fruit), often tinged red, this color sometimes flushing onto the center of the base of the hypanthium; hypanthium 12.5–15 mm diam.; sepals (12–)14–19 × 7–9 mm, ovate-triangular, apically rounded with no subapical projection, pale green to light yellow-green abaxially, nearly white adaxially, strongly reflexing at anthesis; petals (8–)10–14 × 3–5.8 mm, narrowly ovate or lanceolate, the apex rounded or truncate and sometimes slightly erose, white; coronal filaments in 2 series, the outer ca. 33 or 34 in number (N = 2), (6–)7–10 mm long, ca. 1 mm wide, erect at base, slightly dilated distal to the middle and slightly curved-spreading outward, tapering to the apex, somewhat falcate,

Figure 1. Photograph of the holotype of *Passiflora sandrae* J. MacDougal (*Knapp & Mallet 1156*, MO).

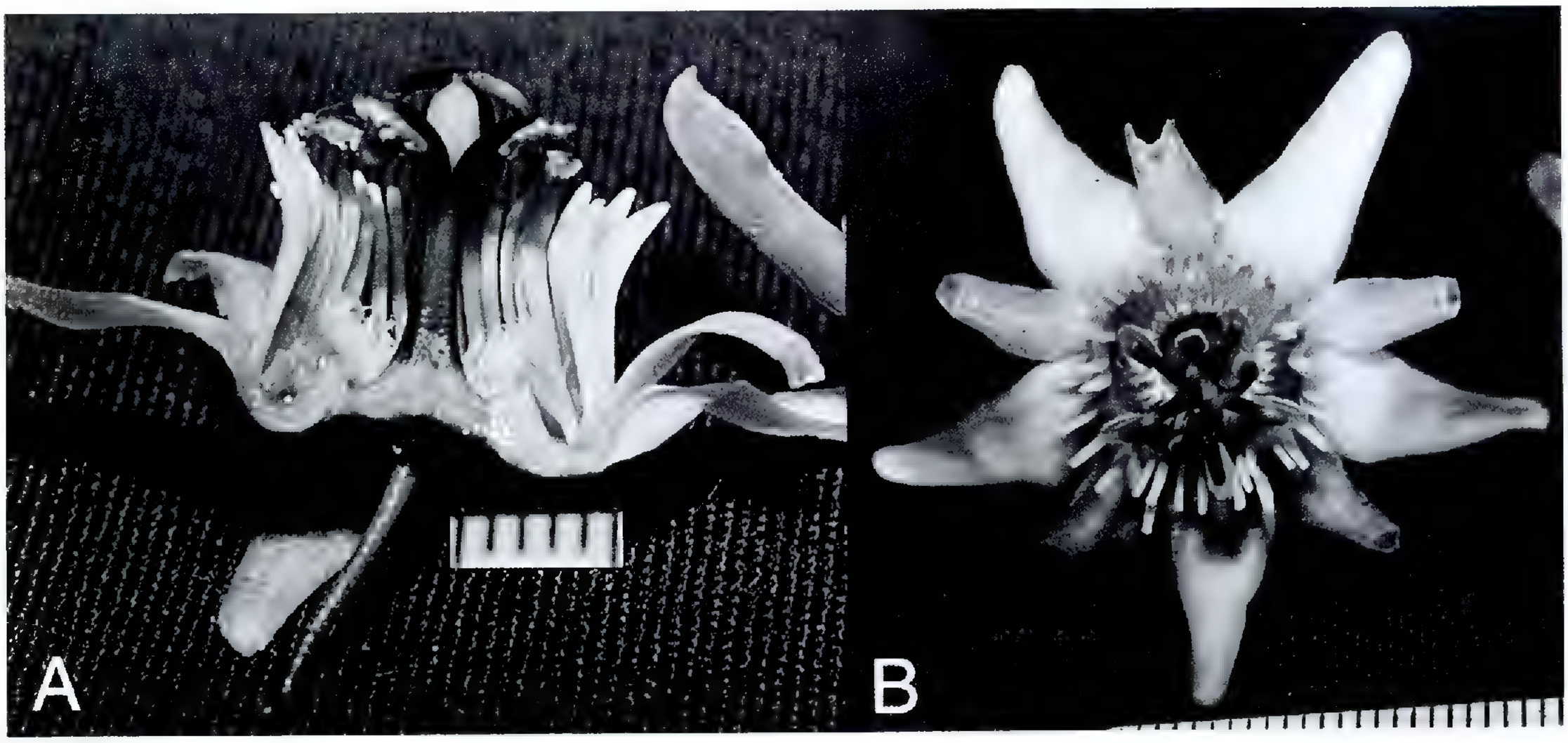

Figure 2. Photographs of the flower of *Passiflora sandrae* J. MacDougal (*Knapp & Mallet 5125*, MO). —A. Longitudinal section. —B. Whole flower. Scale is mm in both.

laterally compressed and sub-3-sided to sub-4-sided in cross section, light yellow-green at base, distally pale green to yellow-green or light yellow, the inner series 1.5–3.5 mm long, capillary, light to dark green-yellow with white tips; operculum 3–4 mm long, membranous, plicate, pale green-white to light yellow-green, sometimes tinged pale purple distally, the apex notably white-fimbriate; raised nectary annulus absent; limen floor conical, pale green, unmarked, the raised edge fleshy; androgynophore 5.5–8 mm, red-purple; staminal filaments red-purple; anthers 3–3.5 mm long, not marked with purple; pollen–coronal distance 3–5 mm; ovary 3–4.5 mm long, ellipsoid, glabrous; styles 4.5–6 mm long including stigmas, red-purple. Fruit a berry, 2.2–3 × 1.5–1.8 cm, ellipsoid to obovoid, sometimes slightly 3-sulcate, estipitate, mature color unknown; arils unknown; seeds 3.8–4.1 × 2.3–2.5 × 1.4–1.5 mm, obovate in outline, dark brown, transversely sulcate with (8)9 to 11(12) sulci, the intervening ridges verrucose, the chalazal beak slightly inclined toward the raphe.

Distribution and ecology. Apparently endemic to Panama, this species occurs from the province of Coclé to southern Darién, and is a part of the otherwise well-known flora of Barro Colorado Island. *Passiflora sandrae* is recorded from forest edges, treefalls, and secondary vegetation in humid to very humid tropical or premontane forest at 0–700(–1000) m elevation.

Phenology. Flowers have been collected throughout the year except July and August; fruits throughout the year except August and September. In the field and in the greenhouse, this species blooms in the early morning and the flowers close by mid to late morning.

Passiflora sandrae is a small to medium-sized climber with bilobed leaves. It belongs to subgenus *Decaloba* (DC.) Reichenbach supersection *Decaloba* (DC.) MacDougal & Feuillet based on the plicate operculum, transversely grooved seeds, laminar nectary position, variegated leaves, and cernuous new growth. It is somewhat similar to *P. biflora* Lamarck, but may be distinguished even in a vegetative or juvenile state by the presence of one rather than two prophylls at the axillary vegetative bud. The leaves are usually conspicuously variegated along the two main lateral veins, and plants from elevations lower than 400 m, in particular, have notably dark-edged laminar nectaries. The leaves of *P. biflora* are never variegated along the main veins, but instead are mottled between the veins if variegated at all. Other differences include 2 to 4 large laminar nectaries always present at the base of the main veins, dark bracts that are not necrescent, buds abruptly narrowed distally, ovaries always glabrous, fruits ellipsoid, and floral stipes always noticeably shorter than the peduncles (i.e., the articulation of the pedicel closer to the flower than the stem).

In one specimen from the province of Coclé (*Gentry 6884*), at the high elevation of 1000 m, the plant as a whole is less puberulent, the stem is subglabrescent with only a few trichomes, and the floral stipe is long, representing the upper limit in the description. A number of specimens of seedlings and juveniles are known. The leaves of the juveniles (e.g., *Netting 68*) bear a close resemblance to the mature foliage of *Passiflora nubicola* MacDougal, a Costa Rican

endemic. The color of the mature fruit is not definitely known—all collections note a greenish immature or yellow-green submature fruit. The label of *Mallet 27* states "fruit green when mature" because it contained dark and apparently mature seeds. It is normal, however, for the seeds to be viable and mature some days before the fruit turns the final ripe color. Most species in supersection *Decaloba* have a dark purplish black fruit that may appear blue due to a glaucous bloom.

Passiflora sandrae was included by Yockteng and Nadot (2004: 385, 393) in their molecular phylogenetic study of the genus *Passiflora*, the name published there as a nomen nudum. In that study, *P. sandrae* fell in subgenus *Decaloba* (cited as subgenus *Plectostemma*) grouped with the other species with conspicuous laminar nectaries. Their analysis was based on a collection from Pipeline Road in the Canal Zone, *Yockteng-112* (P), but I have not seen or confirmed the identity of the specimen.

Etymology. This vine is named for Sandra Knapp (b. 1956) in recognition and honor of her deep contributions to tropical botany and to our understanding of passionflowers. An astute observer and collector of plant life, Sandy made many well-prepared specimens of this species in collaboration with her husband, James Mallet, who had discovered it and realized it was undescribed. Specimens from her Central and South American expeditions with Jim continue to yield many new discoveries in many plant families.

Paratypes. CULTIVATED. Grown 1997–2002 at Missouri Botanical Garden from plant collected by Mallet in Panama (*Gilbert 9259*), 22 Jan. 2002, *MacDougal 6036* (MO). PANAMA. **Canal Zone:** cultivated in Curunda, originally from Pipeline Road near the Río Frijolito, 15 May 1982, *Knapp & Mallet 5125* (MO); Barro Colorado Island, David Fairchild Trail & also at tower on Wheeler Trail, 21 Mar. 1934, *Vetting 68* (CM, MO); Zetek Trail, 27 Oct. 1931, *Shattuck 217* (F, MO); along shore of island E of laboratory, past Colorado Point, 16 Sep. 1968, *Weaver 1603* (DUKE); Zetek Trail, 31 July 1929, *Wetmore & Woodworth 67* (F); T. Barbour 3, 1 Feb. 1932, *Woodworth & Vestal 307* (F, MO); cove N of lab, 1 Feb. 1932, *Woodworth & Vestal 313* (F, MO). **Coclé:** hills above El Valle, 24 Dec. 1972, *Gentry 6884* (MO). **Colón:** near bridge over Quebrada La Furnia on Hwy. 5–8 (82), 17 Sep. 1974, *Mori & Kallunki 1915* (MO). **Darién:** Ensenada del Guayabo, 25 Jan. 1981, *Garwood 1178* (MO); Quebrada Sierpe from Río Tuira to track of Chevy Expedition, 27 Feb. 1972, *Gentry 4437* (MO); ridge to NE of Ensenada El Guayabo, 23 Jan. 1982, *Knapp & Mallet 3068* (MO); rocky ridges near Pacific Ocean, Ensenada El Guayabo, 23 Jan. 1982, *Knapp & Mallet 3133* (MO); N of Punta Guayabo Grande, NW of Ensenada El Guayabo ridges, 25 Jan. 1982, *Knapp & Mallet 3166* (MO); ridges of Filo del Talo, SW of Canglón, 8 Mar. 1982, *Knapp & Mallet 3998* (MO); Río Iglesias, near El Real, 17 Mar. 1982, *Mallet 27* (DUKE). **Panamá:** Majé, along bank of Río Majé ca. 5 mi. up from village of Majé, 18 Nov. 1970, *Foster & Kennedy 2018* (DUKE). **San Blas:** Kuna Yala, Río Mandinga basin, near village of Mandinga, 3 Mar. 1985, *McDade 855* (DUKE); Cangandi, hills near village, 27 Mar. 1986, *de Nevers et al. 7610* (MO).

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Literature Cited

Yockteng, R. & S. Nadot. 2004. Phylogenetic relationships among *Passiflora* species based on the glutamine synthetase nuclear gene expressed in chloroplast (ncpGS). Molec. Phylogenet. Evol. 31: 379–396.

Isolepis tenella, a New Combination in Cyperaceae

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Abstract. Since the publication of a monograph on *Isolepis* (Cyperaceae) in 2002, further data on the genus have been collected, necessitating additional nomenclatural change. *Isolepis* is a predominantly southern hemisphere genus with high species diversity in South Africa and Australia. A new combination is made here: *Isolepis tenella* (L.f.) Muasya & D. A. Simpson, transferring an aberrant annual previously named *Cyperus tenellus*.

Key words: Cyperaceae, *Cyperus tenellus*, *Isolepis tenella*.

Recent systematic studies in the genus *Isolepis* R. Brown in Cyperaceae have led to the publication of a monograph and phylogeny reconstructions at supra- and infrageneric levels (Muasya & Simpson, 2002; Muasya et al., 1998, 2000, 2001, 2002). *Isolepis* comprises 70 species, which are most commonly found in the temperate southern hemisphere, especially in South Africa and Australia. *Isolepis* is sister to *Ficinia* Schrader and, together with three other genera (*Desmoschoenus* J. D. Hooker, *Hellmuthia* Steudel, and *Scirpoides* Scheuchzer ex Séguier), it forms a clade sister to *Cyperus* L. s.l. The *Isolepis* and *Cyperus* s.l. clades are placed in tribe Cypereae, diagnosed by presence of a *Cyperus*-type of embryo (Goetghebeur, 1998). *Isolepis* is distinguished from *Cyperus* on the basis of spikelet morphology, having terete spikelets with spirally arranged glumes versus flattened spikelets with a distichous glume arrangement. However, flattened spikelets and semi-distichous glumes are observed in *Isolepis* (e.g., *I. venustula* Kunth), thus blurring generic boundaries. Also, typical *Cyperus*-like spikelets are observed in *Ficinia*, but the latter genus is diagnosed by the presence of a hypogynous disk.

A phylogenetic study of *Cyperus* s.l. (Muasya et al., 2002), utilizing plastid (*rbc*L, *rps*16 intron, *trn*L intron, and *trn*L-F intergenic spacer) sequence data resolved *Cyperus tenellus* L.f. embedded within the *Isolepis–Ficinia* clade and sister to *Isolepis cernua* (Vahl) Roemer & Schultes. This position has been confirmed by an expanded analysis of Cyperaceae incorporating *rbc*L sequence data (Simpson et al., in press). We are convinced that this taxon belongs to *Isolepis* and make a new combination below.

Isolepis tenella (L.f.) Muasya & D. A. Simpson, comb. nov. Basionym: *Cyperus tenellus* L.f., Suppl. Pl.: 103 (1782). TYPE: South Africa, *Linnean Herbarium no 71/2* (lectotype, designated here, LINN).

Isolepis tenella is a tufted annual to ca. 10 cm tall, that has a pseudolateral inflorescence, spikelets that are flattened with a distichous glume arrangement, and papillose nutlets. *Isolepis tenella* shares its flattened spikelet morphology with *I. venustula* Kunth and has glume and nutlet features that are similar to *I. cernua* (Vahl) Roemer & Schultes. We interpret the presence of flattened spikelets in *I. tenella* to be a character derived from a terete spikelet morphology and consider the taxon to belong to the *I. cernua–I. venustula* clade, members of which have overall morphological and habitat similarity and are phylogenetically most closely related.

A similar interpretation of spikelet morphology was used to transfer *Isolepis leucoloma* (Nees) Archer from *Cyperus* (Archer, 1998). Both species occur in the Western Cape flora of South Africa and were the only annual species of *Cyperus* in that flora. Given that *Isolepis* is the only genus of Cyperaceae that has evolved an annual life form in the Cape flora, the placement of these species within *Cyperus* was inappropriate. We classify *Isolepis tenella* and *I. leucoloma* in *Isolepis* subg. *Isolepis* sect. *Cernuae* (C. B. Clarke) Muasya (sensu Muasya & Simpson, 2002). The three species in this section with flattened spikelets can be separated on gross morphological characters.

Key to the Species in *Isolepis* sect. *Cernuae* with Flattened Spikelets

1a. Rhizomes horizontal; glumes 1.7–2.5 mm, nutlets 1.0–1.4 mm long; restricted to sandy beaches in South Africa . . . . . *I. venustula*

1b. Rhizomes absent or ascending; glumes 1.1–1.7 mm, nutlets 0.6–1.0 mm long; widespread in inland seasonally wet areas, in South Africa and Australia 2

2a. Plants taller, to 10 cm; glumes 1.5–1.7 mm long, pale green; nutlets 0.8–1.0 mm long; in South Africa and Australia. . . . . *I. tenella*

2b. Plants minute, to 3 cm; glumes 1.1–1.2 mm long, dark brown with white margins; nutlets to 0.6 mm long; in South Africa . . . . *I. leucoloma*

While carrying out this work, it became apparent that no type had been designated for *Isolepis tenella*. In the protologue given in *Species Plantarum Supplementarum* (Linnaeus f., 1782), there is no reference to any source of material. However, in the Linnean Herbarium (LINN), there is a single specimen annotated as "*tenella*." This material is instantly recognizable as *I. tenella*. No material corresponding to this species that may have been seen by the younger Linnaeus has been found elsewhere, and it is quite possible that the protologue was based on this specimen. Therefore, we designate *Linnean Herbarium no 71/2* as the lectotype.

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Literature Cited

Archer, C. 1998. A new combination in *Isolepis*. Bothalia 28: 41–42.

Goetghebeur, P. 1998. Cyperaceae. P. 168 *in* K. Kubitzki (editor). The Families and Genera of Vascular Plants 4. Springer, Berlin.

Linnaeus, Carl von, filius. 1782. Supplementum Plantarum Systematis Vegetabilium Editionis Decimae Tertiae, Generum Plantarum Editiones Sextae, et Specierum Plantarum Editionis Secundae. Editum a Carolo a Linné. Brunsvigae [Braunschweig]: 103.

Muasya, A. M. & D. A. Simpson. 2002. A monograph of the genus *Isolepis* R. Br. (Cyperaceae). Kew Bull 57: 257–362.

———, ———, M. W. Chase & A. Culham. 1998. An assessment of the suprageneric phylogeny in Cyperaceae using *rbc*L DNA sequences. Pl. Syst. Evol. 211: 257–271.

———, ———, ——— & ———. 2000. Phylogenetic relationships within the heterogeneous *Scirpus* s. lat. (Cyperaceae) inferred from *rbc*L and *trn*L-F sequence data. Pp. 610–614 *in* K. L. Wilson & D. A. Morrison (editors). Monocots: Systematics and Evolution. CSIRO, Melbourne.

———, ———, ——— & ———. 2001. A phylogeny of *Isolepis* (Cyperaceae) inferred using plastid *rbc*L and *trn*L-F sequence data. Syst. Bot. 26: 342–353.

———, ——— & ———. 2002. Phylogenetic relationships in *Cyperus* s.l. (Cyperaceae) inferred from plastid DNA sequence data. Bot. J. Linn. Soc. 138: 145–153.

Simpson, D. A., A. M. Muasya, M. Alves, J. J. Bruhl, S. Dhooge, M. W. Chase, C. A. Furness, K. Ghamkhar, P. Goetghebeur, T. R. Hodkinson, A. D. Marchant, R. Nieuborg, A. A. Reznicek, E. H. Roalson, E. Smets, J. R. Starr, W. W. Thomas, K. L. Wilson & X. Zhang. In press. Phylogeny of Cyperaceae based on DNA sequence data—A new *rbc*L analysis. *In*: J. T. Columbus, E. A. Friar, J. M. Porter, L. M. Prince & M. G. Simpson (editors). Monocots: Comparative Biology and Evolution, 2 vols. Rancho Santa Ana Botanic Garden, Claremont, California.

Neillia Includes *Stephanandra* (Rosaceae)

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Abstract. Recent phylogenetic analyses of tribe Neillieae in Rosaceae, which comprises *Neillia*, *Physocarpus*, and *Stephanandra*, based on both nuclear and chloroplast DNA sequences revealed that *Neillia* and *Stephanandra* together form a strongly supported monophyletic group and that species of *Stephanandra* are nested within *Neillia*. The close relationship between *Neillia* and *Stephanandra* is also supported by leaf morphology, inflorescence type, and carpel number. In order to better reflect the evolutionary relationships among species of *Neillia* and *Stephanandra*, based on molecular phylogenetic and morphological evidence, *Stephanandra* is united with *Neillia*, and three traditionally recognized species and a hybrid of *Stephanandra* are transferred to *Neillia*. This treatment results in new combinations as follows: *N. hanceana* (Kuntze) S. Oh, *N. incisa* (Thunberg) S. Oh, and *N.* × *nakatsu-riparia* (H. Takahashi) S. Oh. *Stephanandra incisa* (Thunberg) Zabel var. *macrophylla* Hideo Takahashi is treated as a new synonym of *Neillia incisa*.

Key words: *Neillia*, Rosaceae, *Stephanandra*.

Neillia D. Don is a small genus in Rosaceae with about nine species of deciduous shrubs, whose distribution ranges from the Himalayas across China to Korea in the east, and south to Indonesia (Vidal, 1963; Schulze-Menz, 1964; Cullen, 1971; Kalkman, 1993; but see Gu & Alexander, 2003). The genus *Stephanandra* Siebold & Zuccarini consists of three traditionally recognized species and a recently reported putative hybrid (Takahashi, 1991), indigenous to China, Taiwan, Korea, and Japan (Ohwi, 1965; Yu & Ku, 1974; Lee, 1980). The two genera, along with *Physocarpus* (Cambessèdes) Rafinesque, have been classified in the tribe Neillieae (Maximowicz, 1879), which is characterized within Rosaceae by lobed leaves with persistent or deciduous stipules and ovoid shiny seeds with copious endosperm (Vidal, 1963; Oh & Potter, 2005). The monophyly of the tribe is strongly supported by chloroplast DNA sequence data, including *rbc*L (Morgan et al., 1994) and *mat*K and *trn*L genes (Potter et al., 2002). Potter et al. (2002) included all three genera within Neillieae and showed that *Neillia* and *Stephanandra* are more closely related to each other than either is to *Physocarpus*. Furthermore, *Physocarpus* is quite morphologically distinct from *Neillia* and *Stephanandra* in having stellate trichomes, corymbose inflorescences, and inflated follicular fruits dehiscent along both ventral and dorsal sutures.

Neillia and *Stephanandra* have been distinguished based on characters in fruits and seeds (Vidal, 1963; Cullen, 1971), but my examination of herbarium specimens, including the type collections, indicates that the two genera are not clearly separable with these characters. Vidal (1963), in his revision of *Neillia*, stated that follicles of *Stephanandra* incompletely dehisce at maturity, whereas those of *Neillia* are completely dehiscent. However, the mature follicles of some species of *Neillia*, such as *N. sinensis* Oliver, *N. thibetica* Bureau & Franchet, and *N. uekii* Nakai, are not completely dehiscent, with the result that seeds are retained within the follicles, as in the species of *Stephanandra*. Cullen (1971) explained that *Neillia* differs from *Stephanandra* by having a smooth seed coat (vs. crustaceous). While the seed coat of *S. chinensis* Hance and *S. incisa* (Thunberg) Zabel is more or less papillate, there is no distinction in seed coat ornamentation between *S. tanakae* (Franchet & Savatier) Franchet & Savatier and *Neillia*, all of which have smooth surfaces. Vidal (1963) and Cullen (1971) argued that the styles of *Stephanandra* become lateral in fruits, but the majority of specimens of *Stephanandra*, especially of *S. tanakae*, exhibit terminal styles. They (Vidal, 1963; Cullen, 1971) also contended that follicles of *Neillia* contain more seeds than those of *Stephanandra* (2 to 10 vs. 1 or 2), but this can be considered as continuous variation across the two genera.

Phylogenetic analyses using DNA sequence data encompassing both chloroplast and nuclear genes, separately and in combination, have suggested that *Neillia* and *Stephanandra* together form a strongly supported clade and that recognition of two genera, as currently circumscribed, results in a non-monophyletic grouping with *Stephanandra* nested within *Neillia* (Oh & Potter, 2003, 2005). DNA sequence data of chloroplast *trn*L-*trn*F, *trn*D-*trn*T, *mat*K-*trn*K, and *psb*A-*trn*K genic regions and the second intron of the floral homeotic gene, *LEAFY*, congruently supported that *Stephanandra* is monophyletic and nested

within *Neillia*, making *Neillia* a paraphyletic genus (Oh & Potter, 2003, 2005). Spacer regions of nuclear ribosomal DNA (Internal Transcribed Spacer and External Transcribed Spacer) data, however, did not support the monophyly of *Stephanandra*, placing *S. tanakae* as sister to the weakly supported clade of *Neillia*, *S. incisa*, and *S. chinensis*, but neither *Stephanandra* nor *Neillia* was supported as monophyletic (Oh & Potter, 2003, 2005).

The close relationship between *Neillia* and *Stephanandra* is also supported by several morphological characteristics; species in both genera have ovate to lanceolate leaves with acuminate to caudate apices, racemose or paniculate inflorescences, and a single (rarely two) carpel per flower, with the exception of *N. affinis* Hemsley var. *polygyna* Cardot ex J. E. Vidal, which has three to five carpels per flower. *Neillia*, however, differs from *Stephanandra* by having campanulate or cylindric hypanthia (vs. cupulate), with capitate glandular trichomes developing at the fruiting stage (Yu & Ku, 1974; Gu & Alexander, 2003; Oh & Potter, 2005). The cupulate hypanthium in *Stephanandra* represents a reversal to the ancestral state if elongation of the hypanthium (campanulate or cylindric) is a synapomorphy for the *Neillia-Stephanandra* clade (Oh & Potter, 2005).

In order to better reflect evolutionary relationships based on molecular and morphological evidence, Oh and Potter (2005) recommended that *Neillia* and *Stephanandra* be merged into one genus, in which case the name *Neillia* (Don, 1825) should be used because it has priority over *Stephanandra* (Siebold & Zuccarini, 1843). I herein transfer the species of *Stephanandra* to *Neillia*.

1. **Neillia hanceana** (Kuntze) S. Oh, comb. nov. Replaced name: *Physocarpus hanceanus* Kuntze, Revis. Gen. Pl. 1: 218. 1891. *Stephanandra chinensis* Hance, J. Bot. 20: 210. 1882. *Opulaster hanceanus* (Kuntze) Kuntze, Revis. Gen. Pl. 2: 949. 1891. *Stephanandra flexuosa* Siebold & Zuccarini var. *chinensis* (Hance) Pampanini, Nuovo Giorn. Bot. Ital. 17: 297. 1910. TYPE: China. Anhui: "circa urbem Wu-hu," May 1881, *T. L. Bullock s.n.* (holotype, BM).

When *Stephanandra chinensis* is transferred to the genus *Neillia*, the name *N. chinensis* cannot be used because of the prior existence of *N. sinensis* (Oliver, 1886). The epithets, *chinensis* and *sinensis*, are considered as confusingly similar and are treated as homonyms when they are based on different types (cf. Article 53.3; Greuter et al., 2000).

When Kuntze (1891) merged *Neillia* and *Stephanandra* into *Physocarpus*, he published *Physocarpus hanceanus* based on *Stephanandra chinensis*. Although Kuntze (1891) did not explain the rationale behind the nomenclature of *P. hanceanus*, it should be considered as a new replacement name, not as a superfluous name. In his taxonomic treatment, Kuntze (1891) simultaneously transferred both *Stephanandra chinensis* and *Neillia sinensis* to the genus *Physocarpus*. Because he published a new combination *P. sinensis* (Oliver) Kuntze based on the latter name, Kuntze himself made the epithet *chinensis* unavailable in *Physocarpus* in the sense of Article 53.3 (Greuter et al., 2000). Thus, *P. hanceanus* is a legitimate replacement name for *S. chinensis* to avoid simultaneous homonymous combination (cf. Article 11.4, Note 1; Greuter et al., 2000). Since the final epithet *hanceana* is available in *Neillia*, it is adopted in this new treatment.

The leaves of *Neillia hanceana* are very similar to those of *N. sinensis*, such that it is difficult to identify the species without flowering material. The two species, however, are easily distinguished by floral characters: *Neillia hanceana* has panicles of white flowers with cupulate hypanthia, whereas *N. sinensis* has racemes of pink flowers with cylindric hypanthia.

Distribution and habitat. Endemic to southeastern and north central China; moist, open thickets and along streams on slopes under temperate mixed deciduous forests; common; elev. 350 to 1100 m.

Selected specimens examined. CHINA. **Anhui:** Yuexi Xian, Yaohuoping, *Z. Xie et al. 97034* (A). **Fujian:** Taining Xian, Xianqiao Gongshe, Emei Feng, *G. Ye 8* (MO). **Guangdong:** Mt. Danxia, *W. T. Tsang 26432* (A). **Guizhou:** Jiangkou Xian, Heiwan River on SE side of Fanjing mtn. range in vic. of Ecol. Station, Guizhou Acad. Sci., *Sino-American Guizhou Bot. Exp. 350* (A). **Henan:** Mt. Jigong, *Z. Zheng 132* (MO). **Hubei:** Mt. Jigong, border of Hubei & Hunan, on divide betw. Yangtze (Chang) & Huaihe Rivers, *Bailey 1917* (A). **Hunan:** Xining Xian, in valley, *C. Luo 1355* (A). **Jiangsu:** Lianyungang city, Liuhe [Willow River site], *Sino-Amer. Yuntai Bot. Exp. Team 45003* (A). **Jiangxi:** Mt. Dagang, Fenyi city, *K. Yao 9275* (A, MO, NY). **Sichuan:** Chengjiang Xian, Liang Liang Xiao Wan, *T. Dai 100537* (MO). **Zhejiang:** Mt. Tianmu, *T. Y. Liou 92* (NY).

2. **Neillia incisa** (Thunberg) S. Oh, comb. nov. Basionym: *Spiraea incisa* Thunberg, in Murray, Syst. Veg., ed. 14, 472. 1784. *Stephanandra incisa* (Thunberg) Zabel, Gart.-Zeitung (Berlin) 4: 510. 1885. TYPE: Japan, *C. P. Thunberg s.n.* (holotype, UPS).

Stephanandra flexuosa Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3: 740. 1843. *Physocarpus flexuosus* (Siebold & Zuccarini) Kuntze, Revis. Gen. Pl. 1: 219. 1891. *Opulaster flexuosus* (Siebold & Zuccarini) Kuntze, Revis. Gen. Pl. 2: 949. 1891. TYPE: Japan, *P. F. von Siebold s.n.* (holotype, L).

Stephanandra gracilis Franchet & Savatier, Enum. Pl. Jap. 2: 333. 1878. *Physocarpus gracilis* (Franchet & Savatier) Kuntze, Revis. Gen. Pl. 1: 219. 1891. *Opulaster gracilis* (Franchet & Savatier) Kuntze, Revis. Gen. Pl. 2: 949. 1891. TYPE: Japan. Honshu: "in monte Fudsi yama," *L. Savatier s.n.* (holotype, P).

Stephanandra quadrifissa Nakai, Bot. Mag. (Tokyo) 40: 170. 1926. *Stephanandra incisa* (Thunberg) Zabel var. *quadrifissa* (Nakai) T. B. Lee, Illustrated Woody Plants of Korea 272. 1966. TYPE: Korea. Kyunggi: Mt. Surak, *T. Chung s.n.* (holotype, TI not seen).

Stephanandra incisa (Thunberg) Zabel var. *macrophylla* Hideo Takahashi, Bull. Kanagawa Pref. Mus., Nat. Sci. 20: 13. 1991. Syn. nov. TYPE: Japan. Honshu: cultivated in Yokohama, transplanted from the Izu Islands, Mikurajima Island, Mt. Oyama, June 1990. *H. Takahashi 77098* (holotype, KPM not seen; isotype, KPM).

Neillia incisa is widely distributed in eastern Asia, and plants of the species are commonly found in mixed deciduous forests in Korea and Japan. It is quite variable in leaf size and margin. However, there is no clear geographic correlation with the variation of the characters within *N. incisa*. For example, plants with very small leaves and three to five deeply incised lobes (e.g., *H. Muroi 2155*) occur in Cheju Island of Korea, Taiwan, and Japan, while individuals with relatively large leaves and three shallowly incised lobes (e.g., *T. Iwasaki s.n.*) are also found in these regions.

Stephanandra flexuosa was first described by Siebold and Zuccarini (1843) from Japan, based on which the genus *Stephanandra* was segregated. It was, however, cited as a taxonomic synonym of *Stephanandra incisa* when Zabel (1885) transferred *Spiraea incisa* to *Stephanandra*, which has been widely accepted by many authors (Rehder, 1940; Hutchinson, 1964; Yu & Ku, 1974; Gu & Alexander, 2003). Pampanini (1910) published *S. flexuosa* var. *chinensis* on the basis of *S. chinensis*, and this variety refers to *N. hanceana*.

Nakai (1926) distinguished *Stephanandra quadrifissa* from *S. incisa* on the basis of its leaves deeply divided into five lobes, four of which being more or less equal in size. Lee (1966, 1980) treated *S. quadrifissa* as a variety of *S. incisa*, and stated that it is also distributed on Cheju Island. I requested the type specimen of *S. quadrifissa* from TI, but received no response. Examination of herbarium specimens and field observations in Korea, including Cheju Island, suggest that there may be a few individuals clearly referrable to *S. quadrifissa* (e.g., *Taquet 2806*), but that the degree of incision of leaf margin is variable within individuals in the populations.

Takahashi (1991) described *S. incisa* var. *macrophylla* on the basis of its larger leaves and ovate stipules, reporting the taxon on the Izu Islands, including the islands of Oshima, Jiijima, Kozushima, and Mikurajima. Takahashi (1991) ascribed the distinctive features of *S. incisa* var. *macrophylla* to the maritime environment on the islands. However, some specimens from Oshima Island (e.g., *Y. Satake & K. Okamoto 49* at A, NY, UC) do not have such features, and there are collections from the main island of Japan (e.g., *Wilson 6812*) that do show the characteristics. Therefore, I do not recognize *S. incisa* var. *macrophylla* as a distinct taxon.

Distribution and habitat. Widespread from Taiwan, northeastern China, Korea, to Japan; moist, open places and streamside in temperate mixed deciduous forests; common; 10 to 2000 m.

Selected specimens examined. CHINA. **Shandong:** 100 li from Qingdao, Mt. Lao, *C. Y. Chiao 2644* (A, NY [2], UC). JAPAN. **Hokkaido:** Hidaka-shicho, Shizunai-cho, ca. 14 km ENE of Shizunai, off Hwy. 235, *Wood & Boufford 3911* (A, MO). **Honshu:** Hyogo Pref., Akashi, *H. Muroi 2155* (A); Miyagi Pref., Kurokawa-gun, Taiwa-cho, Miyatoko, *T. Iwasaki s.n.* (A); Tochigi Pref., Nikko region, *Wilson 6812* (A). **Kyushu:** Kumamoto Pref., Takamori-cho, Aso-gun, *K. Deguchi 8051* (A, MO). **Shikoku:** Tokushima Pref., Mt. Takagi-yama, Kisawa-mura, Naka-gun, at edge of *Fagus crenata* forest near ridge, *G. Murata et al. 56042* (A). NORTH KOREA. **Pyongan-bukdo:** Taiyudo, French Mine, *Wilson 8607* (A [2], MO). SOUTH KOREA. **Cheju-do:** Cheju Island, "in Quelpart in sepilus Hallaisan," *Taquet 2806* (A). **Cholla-namdo:** Kurye-gun, Mt. Chiri, around Piagol, *C. Chang & H. Takahasi 306* (A). **Kyongsang-bukdo:** Mt. Palgong, *Y. S. Kim 1984* (A). **Kyunggi-do:** Mt. Kwanak, *I. K. Lee 1957* (MO). TAIWAN. Hualian Xian, Mt. Fong, *C. S. Kuo et al. 6965* (MO).

3. Neillia tanakae Franchet & Savatier, Enum. Pl. Jap. 1: 121. 1873. *Stephanandra tanakae* (Franchet & Savatier) Franchet & Savatier, Enum. Pl. Jap. 2: 332. 1878. *Physocarpus tanakae* (Franchet & Savatier) Kuntze, Revis. Gen. Pl. 1: 219. 1891. *Opulaster tanakae* (Franchet & Savatier) Kuntze, Revis. Gen. Pl. 2: 949. 1891. TYPE: JAPAN. Honshu: "ad pedem montis Fudsi yama prope Kameide," *L. Savatier 338* (holotype, P; isotype, K).

Neillia tanakae is morphologically similar to *N. incisa* and *N. hanceana* in having cupulate hypanthia, but differs from these two species in its 15 to 20 stamens per flower and shallowly 3-lobed leaves with acute or acuminate lobe apices. Plants of this species only occur in the areas around Mts. Fuji and Haruna in Japan. Although Cullen (1971) contended that multiple superposed buds are present in the leaf axils of flowering branches, I have not seen any specimens of *N. tanakae* with this characteristic. This feature, however, is occasionally found in *N. incisa*.

Distribution and habitat. Restricted to Gumma, Kanagawa, Shizuoka, and Yamanashi prefectures of central Honshu in Japan; along streams in temperate mixed deciduous forests; rare; 200 to 1300 m.

Selected specimens examined. JAPAN. **Honshu:** Kanagawa Pref., Nakatsukyo, N foot of Mt. Ooyama, Kiyokawa-mura, Aiko-gun, *Y. Fukuoka 6711* (NY, UC).

4. Neillia × nakatsu-riparia (H. Takahashi) S. Oh, comb. nov. Basionym: *Stephanandra × nakatsu-riparia* H. Takahashi, Bull. Kanagawa Pref. Mus., Nat. Sci. 20: 17. 1991. TYPE: Japan. Honshu: Kanagawa, Nakatsu River, Kiyokawa-mura, 21 June 1987, *H. Takahashi 77096* (holotype, KPM not seen; isotype, KPM).

Hybrid formula, sensu H. Takahashi, 1991: *Stephanandra incisa* (Thunberg) Zabel × *Stephanandra tanakae* (Franchet & Savatier) Franchet & Savatier.

This hybrid taxon as described by Takahashi (1991) is morphologically similar to *Neillia incisa*, but exhibits characters intermediate between *N. incisa* and *N. tanakae* in leaf margin, stipule size, and particularly stamen number, which has been used as a diagnostic character to distinguish the two species (Ohwi, 1965). Takahashi (1991) stated that some of the anthers did not mature and that seeds were not developed. Because *N. incisa* and *N. tanakae* are also distributed in the region where *N.* × *nakatsu-riparia* was described, the area around Mt. Fuji in Japan appears to be a hybrid zone for *N. incisa* and *N. tanakae*. Chromosome number of this hybrid is unknown, but the putative parents are both diploid with $2n = 18$ (Iwatsubo & Naruhashi, 1993).

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Literature Cited

Cullen, J. 1971. The genus *Veillia* (Rosaceae) in mainland Asia and in cultivation. J. Arnold Arbor. 52: 137–158.

Don, D. 1825. Prodromus Florae Nepalensis. J. Gale, London.

Greuter, W., J. McNeil, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (St. Louis Code). Regnum Veg. 138.

Gu, C. & C. Alexander. 2003. *Stephanandra*. P. 82 *in*: Z. Wu & P. H. Raven (editors). Flora of China. Vol. 9. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.

Hutchinson, J. 1964. The Genera of Flowering Plants. Vol. 1. Clarendon Press, Oxford.

Iwatsubo, Y. & N. Naruhashi. 1993. Chromosome number and karyotype of two *Stephanandra* species (Rosaceae). Cytologia 58: 93–98.

Kalkman, C. 1993. Novelties in Malesian Rosaceae. Blumea 37: 377–378.

Kuntze, O. 1891. Revisio Generum Plantarum, Pars I. Arthur Felix, Leipzig.

Lee, T. B. 1966. Illustrated Woody Plants of Korea. Forest Experiment Station, Seoul.

———. 1980. Illustrated Flora of Korea. Hyangmunsa, Seoul.

Maximowicz, C. J. 1879. Adnotationes de Spiraeaceis. Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 105–261.

Morgan, D. R., D. E. Soltis & K. R. Robertson. 1994. Systematic and evolutionary implications of *rbc*L sequence variation in Rosaceae. Amer. J. Bot. 81: 890–903.

Nakai, T. 1926. Notulae ad plantas Japoniae & Koreae XXXI. Bot. Mag. (Tokyo) 40: 161–171.

Oh, S. & D. Potter. 2003. Phylogenetic utility of the second intron of *LEAFY* in *Neillia* and *Stephanandra* (Rosaceae) and implications for the origin of *Stephanandra*. Molec. Phylogenet. Evol. 29: 203–215.

——— & ———. 2005. Molecular phylogenetic systematics and biogeography of tribe Neilliieae (Rosaceae) using DNA sequences of cpDNA, rDNA, and *LEAFY*. Amer. J. Bot. 92: 179–192.

Ohwi, J. 1965. Flora of Japan. F. G. Meyer & E. H. Walker (editors). Smithsonian Institution, Washington, D.C.

Oliver, D. 1886. *Veillia sinensis* Oliv. Plate 1540 *in*: J. D. Hooker (editor). Hooker's Icones Plantarum. Williams & Norgate, London.

Pampanini, R. 1910. Le piante vascolari raccolte dal Rev. P. C. Silvestri nell' Hu-peh durante gli anni 1901–1907. Nuovo Giorn. Bot. Ital. 17: 223–298.

Potter, D., F. Gao, P. E. Bortiri, S. Oh & S. Baggett. 2002. Phylogenetic relationships in Rosaceae inferred from chloroplast *mat*K and *trn*L-*trn*F nucleotide sequence data. Pl. Syst. Evol. 231: 77–89.

Rehder, A. 1940. Manual of Cultivated Trees and Shrubs Hardy in North America, Exclusive of the Subtropical and Warmer Temperate Regions. 2nd ed. Macmillan, New York.

Schulze-Menz, G. K. 1964. Rosaceae. Pp. 209–218 *in*: H. Melchior (editor). Engler's Syllabus der Pflanzenfamilien II. Gebrüder Borntraeger, Berlin.

de Siebold, P. F. & J. G. Zuccarini. 1843. Plantarum quas in Japonia collegit Dr. Ph. Fr. de Siebold genera nova, notis characteristics delineationibusque illustrata proponunt. Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3: 717–749.

Takahashi, H. 1991. A new variety and a new hybrid of the genus *Stephanandra* in Japan. Bull. Kanagawa Pref. Mus., Nat. Sci. 20: 11–19.

Vidal, J. 1963. Le genre *Neillia* (Rosaceae). Adansonia 3: 142–166.

Yu, T. & T. Ku. 1974. *Stephanandra*. Pp. 95–98 *in*: T. Yu & T. Ku (editors), Flora Reipublicae Popularis Sinicae, Vol. 36. Science Press, Beijing.

Zabel, H. 1885. *Stephanandra incisa* (Thnbg.) S. et Z. Gart.-Zeitung (Berlin). 4: 510–512.

Conyza sumatrensis var. *leiotheca* (Compositae: Astereae), a New Combination for a Common Neotropical Weed

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Abstract. *Conyza sumatrensis* is recognized as distinct from *C. bonariensis* and *C. canadensis*. *Conyza albida* and *C. floribunda* are treated as synonyms of *C. sumatrensis*. *Conyza sumatrensis* includes two varieties, and the new combination *C. sumatrensis* var. *leiotheca* is made for the nontypical variety, which is restricted to the Americas. *Conyza sumatrensis* var. *sumatrensis* is newly reported and documented in the United States; it also is found widely elsewhere in the Americas and is the sole variety occurring in the Old World.

Key words: Asteraceae, Astereae, Compositae, *Conyza*, *Erigeron*, Mesoamerica, North America.

Conyza sumatrensis (Retzius) E. Walker (synonyms: *Baccharis ivifolia* Blanco, *C. albida* Willdenow ex Sprengel, *C. floribunda* HBK, *Erigeron bonariensis* L. fo. *grisea* Chodat, and *E. musashensis* Makino) is one of the most widespread and weedy species of *Conyza* Lessing (Compositae: Astereae). The species contains two varieties, with the typical variety occurring in both hemispheres and often misidentified as *C. bonariensis* (L.) Cronquist (synonyms: *Erigeron linifolius* Willdenow, fide Blake, 1917, and *E. crispus* Pourret). A second variety of *C. sumatrensis* generally has glabrous involucres, is restricted to the Americas, and is often misidentified as *C. canadensis* (L.) Cronquist. *Conyza sumatrensis* basically differs from *C. canadensis* by disciform (vs. subradiate) capitula and from *C. bonariensis* by a thyrsoid-paniculate (vs. commonly corymbiform) capitulescence. While *C. bonariensis*, *C. canadensis*, and *C. sumatrensis* presumably originated in the New World (Burtt, 1948; Cuatrecasas, 1969; Drake del Castillo, 1886; Peng et al., 1998), each species now occurs pantropically, in the subtropics, and in some temperate zones. Although *Conyza primulifolia* (Lamarck) Cuatrecasas (which includes as a synonym *C. chilensis* Sprengel, the type of *Conyza*) was transferred to *Erigeron* L. by Greuter (2003), we prefer to recognize *Conyza* at the generic rank.

Conyza sumatrensis has been recognized in traditional references (e.g., Candolle, 1836; Persoon, 1807; Poiret, 1808; Sprengel, 1826; Willdenow, 1803), as well as in several Indo-Malay regional floras (e.g., Backer & Bakhuizen van der Brink, 1965; Koster, 1966; Miquel, 1856; Ridley, 1923). Most other floras of the last century or so (e.g., Baker, 1882; Beentje, 2002; Cronquist, 1976, 1980; Cuatrecasas, 1969; Hemsley, 1881), however, recognized only *C. bonariensis* and *C. canadensis* as distinct, yet *C. sumatrensis* occurs in each of these flora regions. Occasionally, *C. sumatrensis* has been recognized as distinct from either or both *C. bonariensis* and *C. canadensis* (e.g., Ariza Espinar, 1982; Barroso, 1959; Burtt, 1948; Cabrera, 1959, 1978; Gray, 1862; Jovet & Vilmorin, 1975; Keil, 1993), but then generally under either the name *C. albida* Willdenow ex Sprengel or *C. floribunda* HBK. Burtt (1948; sub *Erigeron*) appears to be the first to equate *C. floribunda* (1818) and *C. sumatrensis* (1788), but because the type of *C. sumatrensis* was seemingly lost he employed the next available name (*C. floribunda*). Following the works of Marshall (1973, 1974) and Walker (1971), many authors (e.g., Gamisans & Jeanmonod, 1998; Grierson & Springate, 2001; Hajra et al., 1995; Hind et al., 1993; Lisowski, 1991; Nakajima et al., 2001; Peng et al., 1998; Pruski, 1997; Randall, 2002; Sancho & Ariza Espinar, 2003; Soria & Zardini, 1995; Stanley & Ross, 1986; Walker, 1976; Wurzell, 1988) adopted the name *C. sumatrensis*, albeit sometimes in reference to plants of *C. bonariensis* (L.) Cronquist.

Infraspecies of each of the widespread *Conyza bonariensis*, *C. canadensis*, and *C. sumatrensis* are often recognized in floristic treatments (e.g., Cabrera, 1978; Cronquist, 1980; Cuatrecasas, 1969; McVaugh, 1984; Sancho & Ariza Espinar, 2003). Marshall (1974) validated the nontypical varietal name *C. sumatrensis* var. *floribunda* (HBK) J. B. Marshall for plants with a glabrous involucre surrounding disciform capitula, and Marshall (1973, 1974) and Sancho

and Ariza Espinar (2003) treated *C. sumatrensis* as containing solely two varieties. Ariza Espinar (1982) and Guédès and Jovet (1975) treated each variety of *C. sumatrensis* recognized by Marshall (1973, 1974) as a distinct species, but we find that these taxa are not worthy of specific recognition. Rather, we prefer a more conservative approach, thus agreeing with Marshall (1973, 1974) and Sancho and Ariza Espinar (2003) by recognizing *C. sumatrensis* in a broader sense and as including two varieties. Concomitantly, we recognized *C. bonariensis* in a much narrower sense than many authors.

Erigeron bonariensis var. *leiothecus* S. F. Blake (validated by Blake, 1917) was given as a taxonomic synonym of *Conyza sumatrensis* var. *floribunda* by Sancho and Ariza Espinar (2003), but has nomenclatural priority at the varietal rank. We find no other names with priority at this rank and here make the nomenclaturally correct combination for the nontypical variety of *C. sumatrensis* and provide a taxonomic overview of the species. Below we list the most pertinent synonyms; longer lists of synonyms of both varieties are found in Marshall (1973, 1974) and Sancho and Ariza Espinar (2003).

Key to Species Centering about *Conyza bonariensis*

1. Leaves entire, margins generally long-hirsute; capitula subradiate, corollas of marginal florets subradiate; central colored portion of mid-series phyllaries generally narrower than the light-colored phyllary margin; disk corollas generally 4-lobed . . . . . *Conyza canadensis* (L.) Cronquist
1′. Leaves entire to variously incised, margins generally strigulose; capitula generally disciform, corollas of marginal florets tubular, rarely subradiate; central green portion of mid-series phyllaries generally broader than the light-colored phyllary margin; disk corollas 5-lobed.
   2. Plants often gray-pubescent; capitulescence corymbiform with lateral branches overtopping the main axis or less commonly thyrsoid-paniculate, pyramidal; capitula generally few, long-pedunculate; involucre basally broadened; phyllaries sometimes reddish purple-tipped; marginal florets in 4 or more series; fruiting receptacle ca. 4 mm broad; pappus sometimes reddish brown . . . . . *Conyza bonariensis* (L.) Cronquist
   2′. Plants not commonly gray-pubescent; capitulescence thyrsoid-paniculate, generally more or less cylindrical, lateral branches generally not overtopping the main axis; capitula generally many, short- or moderately pedunculate; involucre basally narrowed; phyllaries not reddish purple-tipped; marginal florets in 3 to 4 series; fruiting receptacle 1.5–2.5 mm broad; pappus stramineous.
      3. Stems and leaves subglabrous or sparsely hirsute-pilose; involucres glabrous or rarely weakly puberulent. . . . . *Conyza sumatrensis* var. *leiotheca* (S. F. Blake) Pruski & G. Sancho
      3′. Stems and leaves moderately to densely hirsute-pilose; involucres hirsute-pilose *Conyza sumatrensis* (Retzius) . . . . . E. Walker var. *sumatrensis*

1. Conyza sumatrensis (Retzius) E. Walker, J. Jap. Bot. 46: 72. 1971. Basionym: *Erigeron sumatrensis* Retzius, Obs. Bot. 5: 28. 1789 [1788]. TYPE: Malaysia. Sumatra: Berastagi, Feb. 1921, *H. Ridley s.n.* (neotype, designated by McClintock & Marshall, Watsonia 17: 172. 1988, K not seen).

Conyza sumatrensis is closely related to *C. bonariensis* and *C. canadensis*. Indeed, these three species were treated as adjacent species (sub *Erigeron*) by Sprengel (1826) and Willdenow (1803). However, *E. sumatrensis* was subsequently dropped from common usage, and when recognized was commonly called *C. floribunda* (e.g., Burtt, 1948). *Conyza sumatrensis* has been redescribed occasionally as an infrataxon of *C. bonariensis*, but more commonly it has been treated as a synonym of *C. bonariensis*.

Conyza sumatrensis differs from *C. bonariensis* by capitulescence structure, by smaller capitula with fewer series of marginal florets and fewer disk florets, and by lack of a reddish brown pappus. *Conyza sumatrensis*, however, resembles *C. bonariensis* by generally disciform capitula. *Conyza sumatrensis* differs from *C. canadensis* by lacking well-developed limbs in the corollas of the marginal florets, but resembles *C. canadensis* by similar capitulescence form and by a stramineous pappus. *Conyza sumatrensis* is also similar to *C. glandulitecta* Cabrera of southern South America, differing from *C. glandulitecta* most importantly by lacking vestiture of glandular trichomes.

1a. Conyza sumatrensis (Retzius) E. Walker var. **sumatrensis**

Conyza albida Willdenow ex Sprengel, Syst. Veg., ed. 16. 3: 514. 1826. *Erigeron albidus* (Willdenow ex Sprengel) A. Gray, Proc. Amer. Acad. Arts 5: 319. 1862, as "*albidum*." TYPE: Brazil: sine loc., s.d., *J. Hofmannsegg s.n.* (holotype, B-W 15658 not seen [IDC microfiche 7440. 1124.14]).

Erigeron bonariensis L. var. *microcephalus* Cabrera, Revista Mus. La Plata, Bot. 4(16): 88. 1941. *Conyza bonariensis* (L.) Cronquist var. *microcephala* (Cabrera) Cabrera, Manual Fl. Alred. Buenos Aires 481. 1953. TYPE: Argentina. Buenos Aires: Sierra de la Ventana, 22 Apr. 1939, *A. Cabrera 5160* (holotype, LP).

Conyza bonariensis (L.) Cronquist f. *subleiotheca* Cuatrecasas, Webbia 24: 227. 1969. *Conyza floribunda* var.

subleiotheca (Cuatrecasas) J. B. Marshall, Watsonia 9: 372. 1973. TYPE: Colombia. Boyacá: Soatá, 6 Sep. 1938. *J. Cuatrecasas & H. García Barriga 1026* (holotype, US; isotypes, COL not seen, F not seen).

Conyza groegeri V. M. Badillo, Ernstia n.s., 10: 5. 2000. TYPE: Venezuela. Amazonas: Samariapo, 100 km arriba El Orinoco, San Juan de Ucata, 30 May 1993, *A. Gröger 956* (holotype, VEN not seen).

Distribution. *Conyza sumatrensis* var. *sumatrensis* is seemingly native to the Neotropics, but now occurs pantropically as well as in some temperate zones. The treatment of *C. floribunda* by Keil (1993) is in reference to this variety. *Conyza sumatrensis* var. *sumatrensis* has not previously been reported in the United States; vouchers documenting it in the United States follow: California, *Ahart 4363* (MO); Alabama, *Deramus D324* (MO). *Conyza sumatrensis* var. *sumatrensis* occurs in Mexico (*Gereau et al. 2214* (MO, UC)), throughout Central America (e.g., Costa Rica, *Taylor 4235* (NY)), the West Indies (e.g., Cuba, *Howard 5302* (MO); Jamaica, *Philipson 907* (MO); Puerto Rico, *Otero 337* (MO)), and much of South America (e.g., Colombia, Antioquia, *Zaruechi et al. 5434* (MO, US); Venezuela, *Gröger 935* (US); Guyana, *de la Cruz 2445* (MO, NY); Surinam, *Rombouts 761* (MO); Ecuador, *Tafur et al. 90* (MO); Bolivia, *Abbott 17018* (MO, US); Brazil, *Wasum et al. 6514* (MO)). All material in the Venezuelan Guayana called *C. bonariensis* by Pruski (1997) is redetermined here as *C. sumatrensis* var. *sumatrensis*. All Old World material of *C. sumatrensis* is referable to this variety (e.g., Malaysia, Sumatra, *Toroes 2431* (NY); Philippines, *Merrill 367* (MO); Australia, as cited by Stanley & Ross, 1986; Vietnam, *Cuong 178* (MO); China, Kwangtung, *Tsang 20774* (MO); China, Taiwan, *Boufford et al. 19213* (MO), and as cited by Peng et al., 1998; Japan, *Naito 7295* (MO); Ryukyu Islands, *Tawada 2210* (MO); Sri Lanka, *Waas 701* (MO, US); India, *Saldanha & Ramamoorthy HFP1200* (MO), and as cited by Hajra et al., 1995; Kenya, *Gobbo et al. 765* (MO); Tanzania, *Miller et al. 8529* (MO); Ivory Coast, *Roberty 13568* (MO); Greece, *Karakitsos & Turland 1420* (MO); Corsica, as cited by Gamisans & Jeanmonod, 1998; Spain and France, as cited by Marshall, 1974; Great Britain, as cited by Wurzell, 1988), the bulk of which was formerly determined as *C. bonariensis*.

1b. Conyza sumatrensis var. **leiotheca** (S. F. Blake) Pruski & G. Sancho, comb. nov. Basionym: *Erigeron bonariensis* L. var. *leiotheca* S. F. Blake, Contr. Gray Herb. 52: 28. 1917. *Varsea bonariensis* (L.) V. M. Badillo var. *leiotheca* (S. F. Blake) V. M. Badillo, Bol. Soc. Venez. Ci. Nat. 10: 256. 1946, as "*leiotheca*." *Conyza bonariensis* (L.) Cronquist var. *leiotheca* (S. F. Blake) Cuatrecasas, Phytologia 9: 5. 1963. TYPE: Guatemala. Guatemala: San Rafael, 2135 m, 8 Jan. 1915, *E. Holway 39* (holotype, GH). Figure 1.

Conyza floribunda HBK, Nov. Gen. Sp. (folio ed.) 4: 57. 1820 [1818]. *Erigeron floribundus* (HBK) Schultz Bipontinus, Bull. Soc. Bot. France 12: 81. 1865. *Erigeron bonariensis* L. var. *floribundus* (HBK) Cuatrecasas, Trab. Mus. Nac. Ci. Nat. Jard. Bot. Madrid, ser. Bot. 33: 132. 1936, as "*floribundum*." *Conyza sumatrensis* var. *floribunda* (HBK) J. B. Marshall, Watsonia 10(2): 167. 1974. TYPE: Ecuador. Pichincha: juxta urbem Quito, July 1802, *A. Humboldt & A. Bonpland 3100* (lectotype, designated by P. Green, Fl. Australia 19(1): 381. 1994. P-HBK not seen [IDC microfiche 6209, 95.III.7: photo sub F negative 37821: MO]). The second syntype collection made by Humboldt and Bonpland is from Huancabamba, Peru, but a specimen of this gathering, although seen by Steetz (1854), does not now seem to be present in the Humboldt herbarium (P-HBK).

Conyza floribunda HBK var. *laciniata* Cabrera, Rodriguésia 21–22 (33–34): 119. 1959. TYPE: Brazil. Rio de Janeiro: Rio de Janeiro, 18 May 1959, *E. Pereira 1890* (holotype, LP [2]; isotype, RB not seen, photo LP).

Distribution. *Conyza sumatrensis* var. *leiotheca* is restricted to the Neotropics, where it is frequent, especially in montane areas. The variety occurs from Mexico south to Argentina (e.g., Mexico, *Matuda 2443* (GH, NY); Nicaragua, *Stevens 10912* (MO); Costa Rica, *Pruski et al. 3118* (INB, LP, MO); Colombia, Antioquia, *Zaruechi et al. 6228* (MO); Venezuela, *Fendler 669* (GH, MO); Ecuador, *King & Garvey 6910* (MO, US); Peru, *Galiano et al. 1228* (LP, MO); Bolivia, *Churchill & Arroyo 21473* (MO); Brazil, *Hatschbach 33557* (MBM, MO); Argentina, *Cabrera & Frangi 20591* (LP)).

This variety is remarkably consistent morphologically throughout much of its range. As is to be expected with weedy species, however, variants are known. Notable among such deviants are rarely encountered plants with linear-lanceolate leaves. Such plants are reminiscent of *Conyza canadensis*, but the central broadly darkened glabrous phyllaries place such plants within the limits of *C. sumatrensis* var. *leiotheca*. Some of these linear-lanceolate leaved plants have peduncles to ca. 2.5 cm long and fewer, broader phyllaries. In these features, such material resembles southern South America *C. blakei* (Cabrera) Cabrera (syns. *Erigeron bonariensis* f. *filifolia* Chodat, *E. monteridensis* Baker, non Sprengel, *Erigeron spiculosus* Hooker & Arnott var. *minor* Hooker f.). However, these linear-lanceolate leaved plants with broad phyllaries and long peduncles do not have the pinnatifid leaves that characterize *C. blakei*, and are thus seemingly best retained within *C. sumatrensis* var. *leiotheca*.

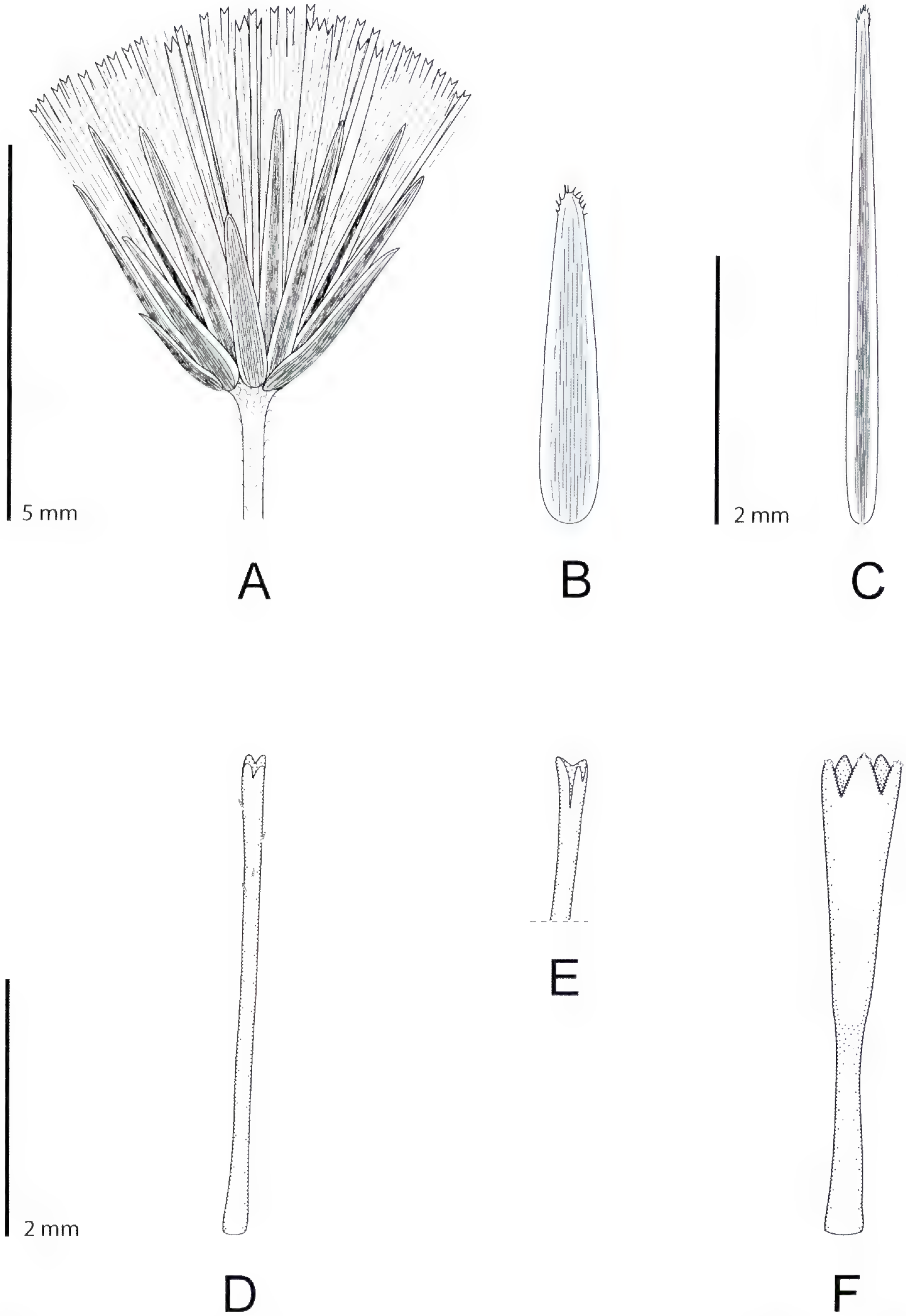

Figure 1. *Conyza sumatrensis* var. *leiotheca* (S. F. Blake) Pruski & G. Sancho. —A. Capitulum. —B. Mid-series phyllary. —C. Inner phyllary. —D. Corolla of pistillate marginal floret, apex 4-denticulate. —E. Apex of tridenticulate corolla of pistillate marginal floret. —F. Corolla of bisexual disk floret. (Drawn by Gisela Sancho from *Cabrera & Frangi 20594*, LP.)

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Literature Cited

Ariza Espinar, L. 1982. *Conyza albida* (Compositae) en Argentina. Bol. Soc. Argent. Bot. 21: 269–271.

Backer, C. A. & R. C. Bakhuizen van den Brink Jr. 1965. Asteraceae. Pp. 362–437 *in* Flora of Java (Spermatophytes only), Vol. 2. Noordhoff, Groningen, The Netherlands.

Baker, J. G. 1882. Compositae III. Asteroideae et Inuloideae. Pp. 1–134 *in* C. F. P. Martius (editor), Flora Brasiliensis, Vol. 6, part 3. Fleischer, Lipsiae.

Barroso, G. L. 1959. Flora da Cidade do Rio de Janeiro: Compositae. Rodriguésia 21–22(33–34): 69–155.

Beentje, H. J. 2002. Compositae (Part 2). Flora of Tropical East Africa. Balkema, Rotterdam.

Blake, S. F. 1917. New and noteworthy Compositae, chiefly Mexican. Contr. Gray Herb. 52: 16–59.

Burtt, B. L. 1948. On *Erigeron bonariensis* Linn. Kew Bull. 3: 369–372.

Cabrera, A. L. 1939. Notas sobre tipos de Compuestas sudamericanas en herbarios europeos. I. Bol. Soc. Argent. Bot. 7: 233–246.

———. 1978. Compositae. Flora de la Provincia de Jujuy, parte X. INTA, Buenos Aires.

Candolle, A. P. de 1836. Compositae (Compositarum tribus priodes). Prodromus systematis naturalis regni vegetabilis, Vol. 5. Treuttel & Würtz, Paris.

Cronquist, A. 1976. *Conyza*. P. 120 *in* T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters & D. A. Webb (editors), Flora Europaea, Vol. 4. Cambridge Univ. Press, Cambridge.

———. 1980. Asteraceae. Vascular Flora of the Southeastern United States, Vol. 1. Univ. North Carolina Press, Chapel Hill.

Cuatrecasas, J. 1969. Prima Flora Colombiana. 3. Compositae-Astereae. Webbia 24: 1–335.

Drake del Castillo, E. 1886. Illustrationes Florae Insularum Maris Pacifici. Masson, Paris.

Gamisans, J. & D. Jeanmonod. 1998. Asteraceae-I. Compl. Prod. Fl. Corse, ser. monogr. Asteraceae I: 1–340.

Gray, A. 1862. Notes upon a portion of Dr. Seemann's recent collection of dried plants gathered in the Feejee Islands. Proc. Amer. Acad. Arts 5: 311–321.

Greuter, W. 2003. The Euro + Med treatment of Astereae (Compositae)—Generic concepts and required new names. Willdenowia 33: 45–47.

Grierson, A. J. C. & L. S. Springate. 2001. Compositae (Asteraceae). Pp. 1397–1632 *in* A. J. C. Grierson & D. G. Long (editors), Flora of Bhutan, including a record of plants from Sikkim and Darjeeling, Vol. 2, part 3. Royal Botanic Garden, Edinburgh & Royal Government of Bhutan.

Guédès, M. & P. Jovet. 1975. *Conyza albida* Willd. ex Sprengel, the correct name for "*C. altissima*" Naudin ex Debeaux (*C. naudinii* Bonnet). Taxon 24: 393–394.

Hajra, P. K., R. R. Rao, D. K. Singh & B. P. Uniyal. 1995. Flora of India, Vol. 12, Asteraceae (Anthemideae–Heliantheae). Botanical Survey of India, Calcutta.

Hemsley, W. B. 1881. Compositae. Pp. 69–263 *in* E. D. Godman & O. Salvin (editors), Biologia Centrali-Americana; Or Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America. Botany, Vol. 2. Porter, London.

Hind, D. J. N., C. Jeffrey & V. J. Scott. 1993. Composées. Flore des Mascareignes. Royal Botanic Gardens, Kew.

Jovet, P. & R. de Vilmorin. 1975. Flore descriptive et illustrée de la France par l'abbé H. Coste, suppl. 3. Librairie Scientifique et Technique Albert Blanchard, Paris.

Keil, D. J. 1993. Asteraceae [Compositae] Sunflower Family. Pp. 174–361, 365 *in* J. C. Hickman (editor), The Jepson Manual: Higher Plants of California. Univ. California Press, Berkeley.

Koster, J. T. 1966. The Compositae of New Guinea I. Nova Guinea, Bot 21: 497–614.

Lisowski, S. 1991. Les Asteraceae dans la flore d'Afrique Centrale (excl. Cichorieae, Inuleae et Vernonieae), Vol. 1. Polish Academy of Sciences, Kraków.

Marshall, J. B. 1973. Conyza: Taxa found in Britain. Watsonia 9: 372–373.

———. 1974. A note on *Conyza sumatrensis* (Retz.) E. Walker (*C. floribunda* Kunth). Watsonia 10: 166–167.

McClintock, D. & J. B. Marshall. 1988. On *Conyza sumatrensis* (Retz.) E. Walker and certain hybrids in the genus. Watsonia 17: 172–173.

McVaugh, R. 1984. Compositae. Flora Novo-Galiciana: A descriptive account of the vascular plants of western Mexico, Vol. 12. Univ. Michigan Press, Ann Arbor.

Miquel, F. A. W. 1856. Compositae. Pp. 1–116 *in* Flora van Nederlandsch Indië, Vol. 2, part 1. Van der Post, Amsterdam.

Nakajima, J. N., R. L. Esteves, V. Gonçalves-Esteves, M. A. G. Magenta, R. S. Bianchini, J. F. Pruski & D. J. N. Hind. 2001. Familia 159—Asteraceae. Flora Fanerogâmica da Reserva do Parque Estadual das Fontes do Ipiranga (São Paulo, Brasil). Hoehnea 28: 111–181.

Peng, C.-I., K.-F. Chung & H.-L. Li. 1998. Compositae Pp. 807–1101 *in* Editorial Committee of the Flora of Taiwan, Flora of Taiwan, ed. 2, vol. 4. National Taiwan University, Taipei.

Persoon, C. H. 1807. Synopsis plantarum, seu Enchiridium botanicum, complectens enumerationem systematicam specierum hucusque cognitarum, Vol. 2. Treuttel & Würtz and Tubingae, Paris.

Poiret, J. L. M. 1808. *In* J. B. Lamarck (editor), Encyclopédie Méthodique: Botanique, Vol. 8. Agasse, Paris.

Pruski, J. F. 1997. Asteraceae. Pp. 177–393 *in* J. A. Steyermark, P. E. Berry & B. K. Holst (editors), Flora of the Venezuelan Guayana, Vol. 3, Araliaceae–Cactaceae. Missouri Botanical Garden Press, St. Louis.

Randall, R. P. 2002. A global compendium of weeds. R. G. & F. J. Richardson, Melbourne.

Ridley, H. N. 1923. Compositae. Pp. 177–197 *in* The Flora of the Malay Peninsula, Vol. 2. Reeve, London.

Sancho, G. & L. Ariza Espinar. 2003. Asteraceae, parte 16: Tribu III. Astereae, parte B. Subtribus Bellidinae, Asterinae (excepto *Grindelia* y *Haplopappus*). Flora Fanerogámica Argentina Fascículo 81: 1–102. Proflora, CONICET, Córdoba.

Soria, N. & E. M. Zardini. 1995. Sinopsis de la tribu Astereae (Asteraceae) en Paraguay. Pp. 355–378 *in* D. J. N. Hind, C. Jeffrey & G. V. Pope (editors), Advances in Compositae Systematics: Compositae Systematics, Biology, Utilization. Royal Botanic Gardens, Kew.

Sprengel, K. 1826. Caroli Linnaei, Systema Vegetabilium, Vol. 3. Librariae Dieterichianae, Göttingen.

Stanley, T. D. & E. M. Ross. 1986. Flora of South-eastern Queensland, Vol. 2. Queensland Department of Primary Industries, Brisbane.

Steetz, J. 1854. Compositae. Pp. 139–163 *in* B. Seemann. 1854. The Botany of the Voyage of H.M.S. Herald: Under the Command of Captain Henry Kellett, R.N., C.B., During the Years 1845–51. Lovell Reeve, London.

Walker, E. H. 1971. Critical taxonomic changes concerning the plants of Okinawa and the southern Ryukyu Islands. J. Jap. Bot. 46: 65–72.

———. 1976. Flora of Okinawa and the southern Ryukyu Islands. Smithsonian Institution Press, Washington, D.C.

Willdenow, C. L. 1803. Species Plantarum (editio quarta), Vol.3, part 3. Berlin.

Wurzell, B. 1988. *Conyza sumatrensis* (Retz.) E. Walker established in England. Watsonia 17: 145–148.

Palmorchis caxiuanensis, a New Species of Orchidaceae from Eastern Amazonia, Brazil

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Abstract. A terrestrial orchid, *Palmorchis caxiuanensis*, is described from the Amazonian rain forest of Pará State, northern Brazil. Flowers and habit are illustrated. This species is clearly allied to *Palmorchis sobralioides*, *P. guianensis*, and *P. duckei*, but is distinguished by the length of the petiole, lip, and column.

Resumo. Uma orquídea terrestre, *Palmorchis caxiuanensis*, é descrita para Amazônia, estado do Pará, Norte do Brasil. Flores e hábito são ilustrados. Esta espécie é próxima de *Palmorchis sobralioides*, *P. guianensis* e *P. Duckei*, diferindo basicamente pelo comprimento do pecíolo, labelo e coluna.

Key words: Brazil, Orchidaceae, *Palmorchis*.

According to Dressler (1993), *Palmorchis* Barbosa Rodrigues is a genus of about 12 Neotropical species belonging to the tribe Palmorchideae (Dressler) Dressler (Orchidaceae). Hoehne (1945) and Pabst and Dungs (1975) cite only five species known to occur in Brazil. The genus is characterized by having the lip partly united with the column along the midline (Dressler, 1993).

Recent botanical explorations of the Ferreira Penna Scientific Station in Caxiuanã National Forest, Municipality of Melgaço in the state of Pará, Brazil, have led to the discovery of a taxon distinct from previously described Brazilian species of *Palmorchis*.

Palmorchis caxiuanensis Rocha, S. S. Almeida & Freitas, sp. nov. TYPE: Brazil. Pará: Melgaço, Caxiuanã Nat. Forest (FLONA de Caxiuanã), Ferreira Penna Sci. Station, 1°42′30″S, 51°31′45″W, 22 Jan. 2004, *M. A. Freitas F1027* (holotype, MG). Figure 1.

Herba terrestris erecta 30–60 cm alta, 4 ad 7-foliatis, folio erecto, lamina elliptica lanceolata, 5-nervata, 28–35 cm longa, supra medium 4.5–6.5 cm lata, petiolo 5–8 cm, racemo terminali; bracteis amplexicaulibus; sepalis oblongo-spathulatis, subaequilongis, apicularis; lateralibus paulo falcatis; petalis sepalis lateralibus similibus; labelo inferne basi columnae adnato, triangularis, 12 mm longo, inter apices loborum lateralium 8 mm lato, medio lamellis 2 longis parallelis ornato 2 mm, lobis lateralibus truncate, intermedio oblongo triangularis; columna 10 mm longa, semi-cilindrica, apice livissime incurvata.

Terrestrial herb, 30–60 cm tall, caespitose. Leaves 4 to 7, erect, alternate, distichous to gradually spiral; leaf sheaths ca. 5 cm long; petiole 5–8 cm long; blades 5-veined, 28–35 × 4.5–6.5 cm, elliptic-lanceolate to oblanceolate, base attenuate, apex acuminate, glabrous. Inflorescences 1 or 2 terminal racemes, 5–6 cm long, with 1 or 2 inflorescence bracts; bracts foliaceous, lanceolate, 3–12 × 1–3.5 cm, glabrous, apices acuminate. Floral bracts deltoid, acuminate, distichous, bases amplexicaul, 8–9 × 4–6 mm, glabrous; pedicel and ovary 1.0–1.5 cm long; sepals greenish white, apiculate, subequal; dorsal sepal 15–17 × 3.5–4.0 mm, apex acute, oblong-spathulate, slightly carinate, mid-nerve prominent; lateral sepals subfalcate, 14–15 × ca. 4 mm; petals similar to lateral sepals; lip white, triangular, ca. 12 mm long, 8 mm between lateral lobes, extending from the middle of the lateral lobes; disc with a pair of short distant keels, parallel, 2 mm length; base pubescent, adnate to the column, mid-lobe prominent, ca. 2.5 mm long, apex acute; lateral lobes truncate; apical lobe oblong-triangular; column semi-cylindrical, semi-erect, gently arcuate at apex, pilose in lowest third part and on ventral surface, ca. 10 mm long; anthers rounded, 1.5 × 1.5 mm; pollinia 4, ca. 0.5 mm long.

Ecology. *Palmorchis caxiuanensis* occurs on the plateaus separating the small rivers that drain this area of Amazonian lowland rain forest. Plants occur in clusters of about 5–10 m in diameter, with up to 10 plants per cluster. Two to five clusters were found in the one hectare sampled in the Caxiuanã area.

The species has been recently discovered, so its status of conservation is still being evaluated (sensu IUCN). However, it seems that its distribution is known only in the lower part of the basin of the Anapu River (Amazonia).

Phenology. Flowering and fruiting occurs between December and May, during the rainy season.

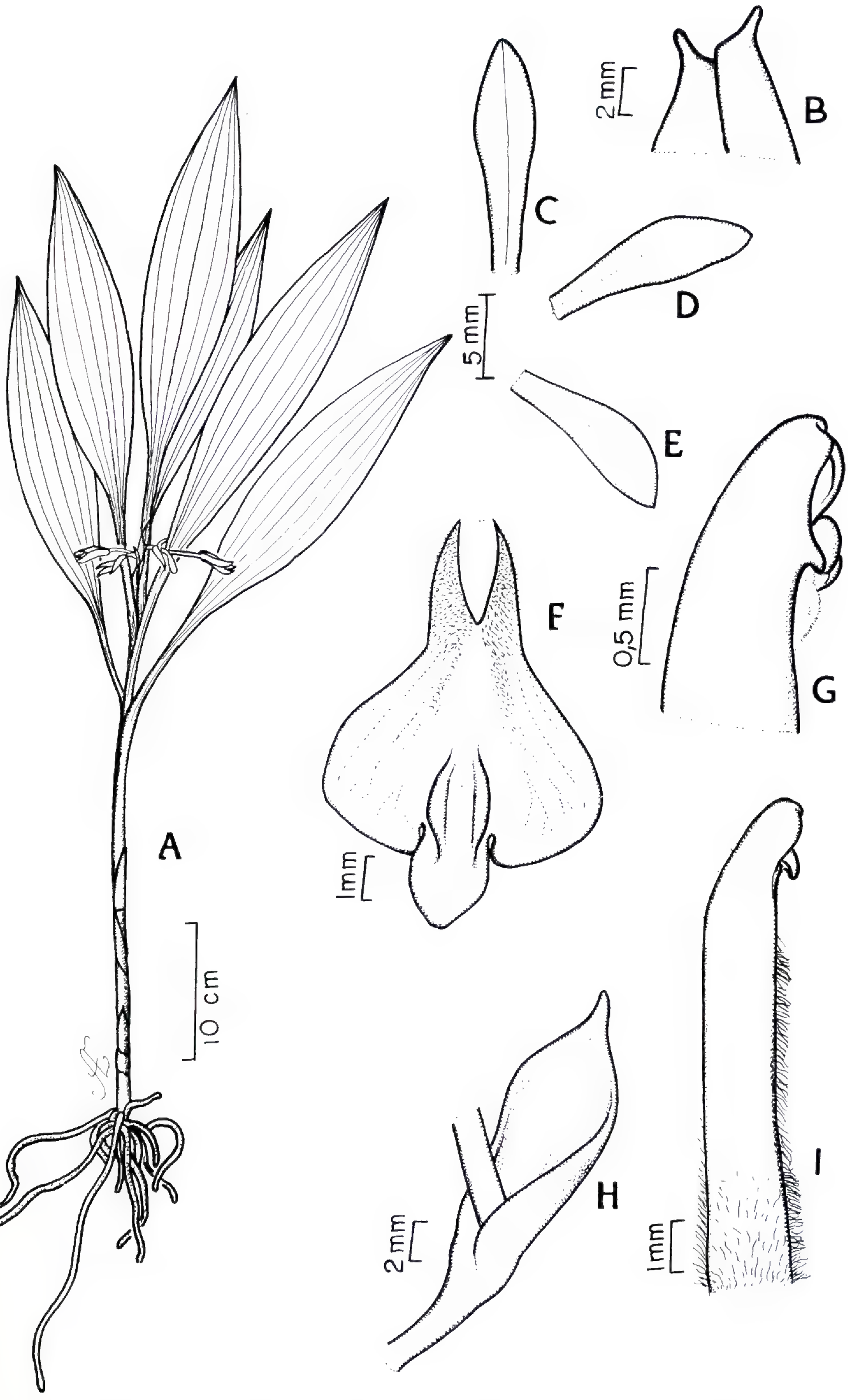

Figure 1. Habit and floral structures of *Palmorchis caxiuanensis*. —A. Habit. —B. Petal apex. —C. E. Sepals. —D. Petal. —F. Lip. —G. Column detail. —H. Floral bract. —I. Lateral view of column (*M. A. Freitas F1027*, MG).

Table 1. Morphological characters used to separate *Palmorchis caxiuanensis* from *P. duckei*, *P. guianensis*, and *P. sobralioides*.

P. caxiuanesis	*P. duckei*	*P. guianensis*	*P. sobralioides*
Leaves 5-veined	Leaves 7-veined	Leaves 5-veined	Leaves 5-veined
Petiole 5–8 cm long	Petiole 2–5 cm long	Petiole 7–13 cm long	Leaves sessile
Petals and sepals greenish white	Petals and sepals lilac	Petals and sepals greenish white	Petals and sepals greenish white
Column 10 mm long, pilose	Column 18 mm long, glabrous	Column 10 mm long, glabrous	Column 14 mm long, pilose
Lip 12 × 8 mm, margin ciliate, lateral lobes truncate	Lip 17 × 12 mm, margin glabrous, lateral lobes rounded	Lip 8 × 4–5 mm, margin ciliate, lateral lobes rounded	Lip 11 × 8 mm, margin glabrous, lateral lobes rounded

Paratypes. BRAZIL. **Pará:** Melgaço, Caxiuanã Nat. For. (FLONA de Caxiuanã), Ferreira Penna Scientific Station, 22 Jan. 2004, *M. A. Freitas F1028* (MO); 7 Feb. 2004, *M. A. Freitas F1029* (IAN).

Palmorchis caxiuanensis is morphologically most similar to its congeners *P. sobralioides* Barbosa Rodrigues, *P. guianensis* (Schlecter) C. Schweinfurth & Correll, and *P. duckei* Hoehne. However, the morphological characters cited in Table 1 readily separate them.

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Literature Cited

Dressler, R. L. 1993. Phylogeny and Classification of the Orchid Family. Harvard Univ. Press, Cambridge.

Hoehne, F. C. 1945. *Palmorchis*. Flora Brasilica 12(2): 203–209. Romiti & Lanzara, São Paulo.

Pabst, G. F. J. & F. Dungs. 1975. Orchidaceae Brasiliensis II. Brucke-Verlag Kurt Schmersow, Hildesheim.

Phaseolus novoleonensis, a New Species (Leguminosae, Phaseolinae) from the Sierra Madre Oriental, Nuevo León, Mexico

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Abstract. A new species of *Phaseolus* occurs on the eastern slope of Sierra Madre Oriental of Mexico, in the state of Nuevo León, at the northeastern corner of the Chihuahuan desert. Because of its coriaceous leaflets, *Phaseolus novoleonensis* belongs to section *Coriacei* Freytag. Although morphologically related to *P. maculatus* subsp. *maculatus* and subsp. *ritensis*, it differs by its having trifoliolate leaves at first nodes, small rounded leaflets, few-noded racemes, and flattened cream-colored seeds.

Resumen. Una nueva especie de *Phaseolus* ha sido encontrada en la vertiente oriental de la Sierra Madre Oriental de México, en el estado de Nuevo León. Los foliolos coriáceos indican que pertenece a la sección *Coriacei* Freytag. Aunque esta especie es cercana a las subespecies de *P. maculatus*, i.e. subsp. *maculatus* y subsp. *ritensis*, se diferencia por tener hojas trifolioladas en los primeros nudos, foliolos pequeños y redondos, racimos con pocas inserciones y semillas aplanadas de color crema. Su rango de distribución parece limitado a la parte nororiental de la Zona Árida Chihuahuense de México.

Key words: Fabaceae, Mexico, Neotropics, *noroleonensis*, Phaseoleae, *Phaseolus*.

In a recent monograph (Freytag & Debouck, 2002), "*Phaseolus metcalfei* and its close relatives," as recognized early by Piper (1926), were classified in the section *Coriacei* Freytag. Recognition of this group was supported by molecular evidence (Delgado et al., 1999). *Phaseolus* section *Coriacei* includes four wild bean taxa (*P. maculatus* Scheele subsp. *maculatus*, *P. maculatus* Scheele subsp. *ritensis* (Jones) Freytag, *P. venosus* Piper, and *P. reticulatus* Freytag & Debouck) with prostrate, trailing stems from perennial thick roots and coriaceous, leathery, ovate to rhombic leaflets. These taxa are mainly distributed in the Chihuahuan desert, extending from the Trans-Pecos region of southwestern Texas as far south as Puebla in Mexico (Freytag & Debouck, 2002). While exploring the geographical limit of this group in northeastern Mexico, or the regions of Sierra Madre Oriental and Huasteca in the late 1980s, the senior author found specimens that eventually proved to be different from all the species related to *P. metcalfei* Wooton & Standley, which is known as the 'Metcalfe bean' in honor of J. K. Metcalfe, the agronomist who studied and distributed the legume (Nabhan et al., 1980; Wooton & Standley, 1913).

Phaseolus novoleonensis Debouck, sp. nov. TYPE: México. Nuevo León: Iturbide, 2 km E of Los Altares, 0.5 km W Puente Santa Rosa, near El Ebanito, 99 50′W, 24 43′N, 970 m, 10 Nov. 1986, *D. G. Debouck & J. Muruaga Martínez 2061* (holotype, IBUG; isotypes, ANSM, BR, CHAPA, COL, ENCB, F, G, K, MEXU, MICH, MO, P, SI, UC, US). Figures 1–4.

Haec species *Phaseolo maculato* subsp. *maculato* similis, sed ab eo foliolis rotundis minoribus racemis brevioribus primariis bracteis brevioribus seminibus complanatis minoribusque distinguitur. Crescit in montibus occidentalibus citatis Linaris Novoleonensis rarus.

Seedling 8–9 cm high, from hypogeal germination; cotyledons slightly petiolate, spreading jointly downward; epicotyl green, terete, 45–90 mm long, covered with white uncinate trichomes. Eophylls (primary leaves) simple, broadly triangular, green (137B on *Royal Horticultural Society Colour Chart*, 1966), opposite, loosely pilose margins, puberulent with minute white uncinate trichomes, 39 × 29 mm, base slightly cordate; petioles canaliculate, green, 20–22 mm long, stipels absent, pulvini green, pubescent; stipules triangular, reflexed, basifixed, 1–2 mm long, bifid to double, 3-nerved, green. First true leaf trifoliolate, leaflets rhombic to orbicular (Fig. 1m). *Root* pluriannual, thick, fleshy, tapering, fusiform, 11 cm long, 2.5 cm diam. in thickened part (possibly more in older plants), yellow (163D) drying dark brown (199A), barred with horizontal brown lenticels, with 5 to 7 lateral roots becoming thickened, spreading from the upper third, profusely, finely branched below (Fig. 1a). *Plant* a short-lived perennial, rosette of 4 to 7 stems 50–150 cm long, spreading from eophyll node and basal stem nodes. Stems sprawling, nonclimbing, terete, green (147A)

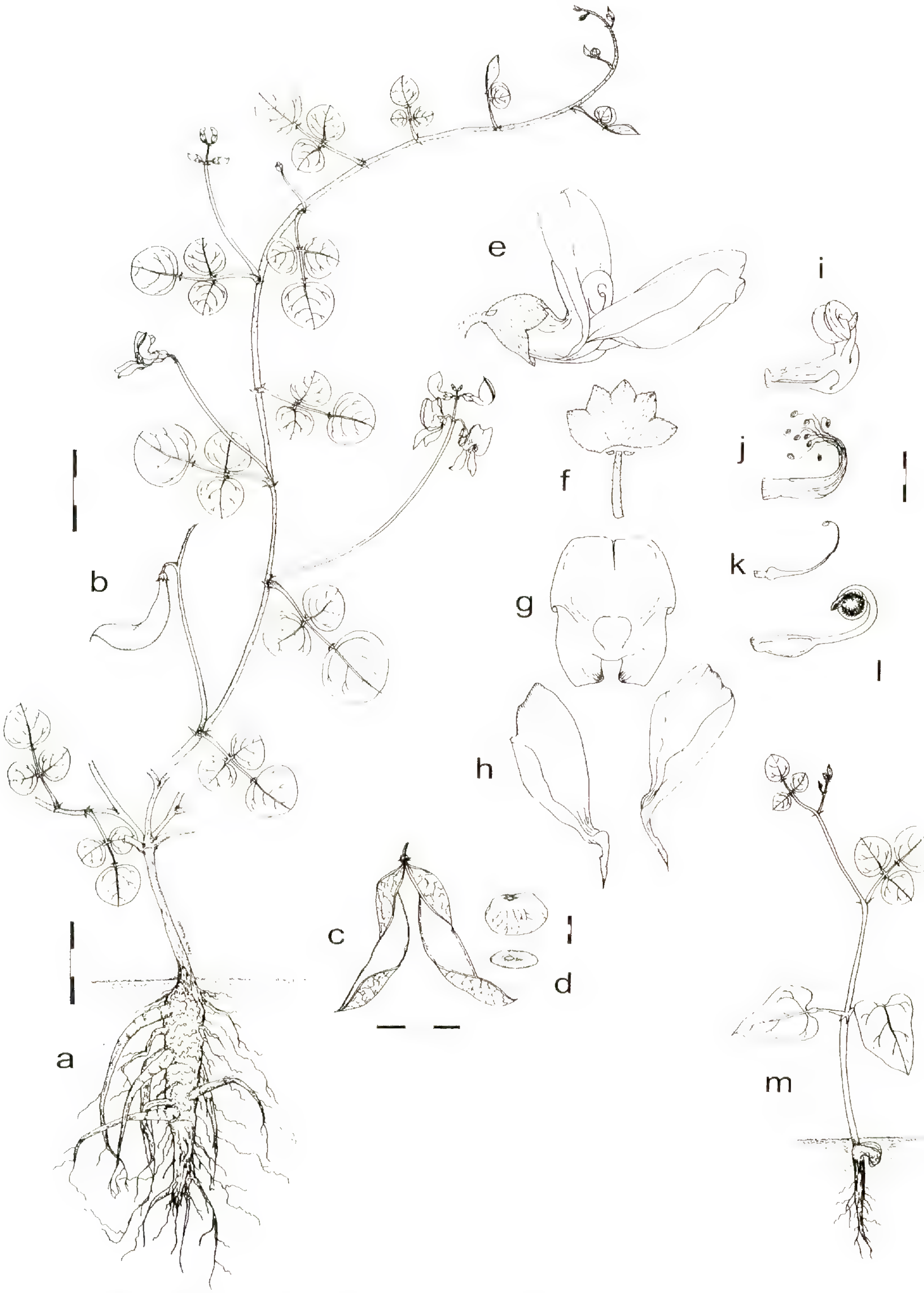

Figure 1. *Phaseolus noroleonensis* Debouck. —a. Root system and lower part of one-year plant. —b. Habit of fertile stem. —c. Pod. —d. Seed. —e. Flower (lateral view). Floral parts (f–h): —f. Pedicel, bracteoles, and calyx. —g. Standard. —h. Wings. —i. Keel. —j. Staminal tube. —k. Vexillary stamen. —l. Ovary and style. —m. Seedling. Scale: a–c, m in cm; d–l in mm. All drawings made from plants grown in Palmira, Colombia, from seed of the type collection (*Debouck & Maruaga 2061*, IBUG).

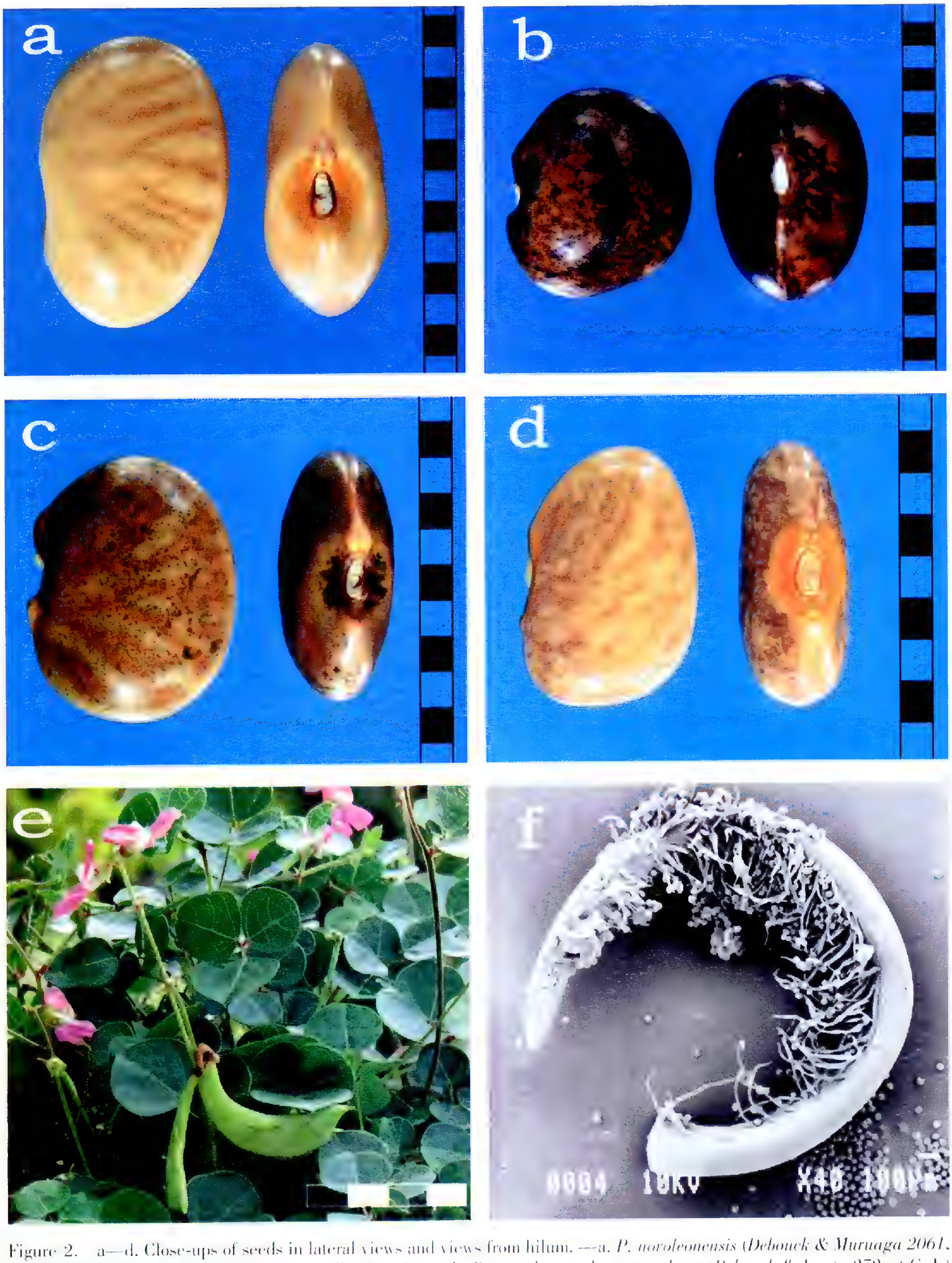

Figure 2. a—d. Close-ups of seeds in lateral views and views from hilum. —a. *P. novoleonensis* (*Debouck & Maruaga 2061*, as accession G40590 at CIAT) from type collection site. —b. *P. maculatus* subsp. *maculatus* (*Debouck & Acosta 272*, at G, K) from volcano "El Jagüey," Durango, Mexico. —c. *P. maculatus* subsp. *ritensis* (*Buhrow GVR*, as accession PI535372 at USDA-Pullman, WA) from Geology Vista, Santa Catalina Mountains, Pima Co., Arizona, U.S.A. —d. *P. vulgaris* (*Maruaga 4002*, as accession G24571 at CIAT) from Tilapa, Oaxaca, Mexico. Please note the considerable difference in scale for 2b: each square length is 1 mm. —e. Living plant growing in Palmira station, Valle del Cauca, Colombia. Scale in cm. —f. SEM micrograph of the distal portion of style and stigma. Scale bar: 0.1 mm.

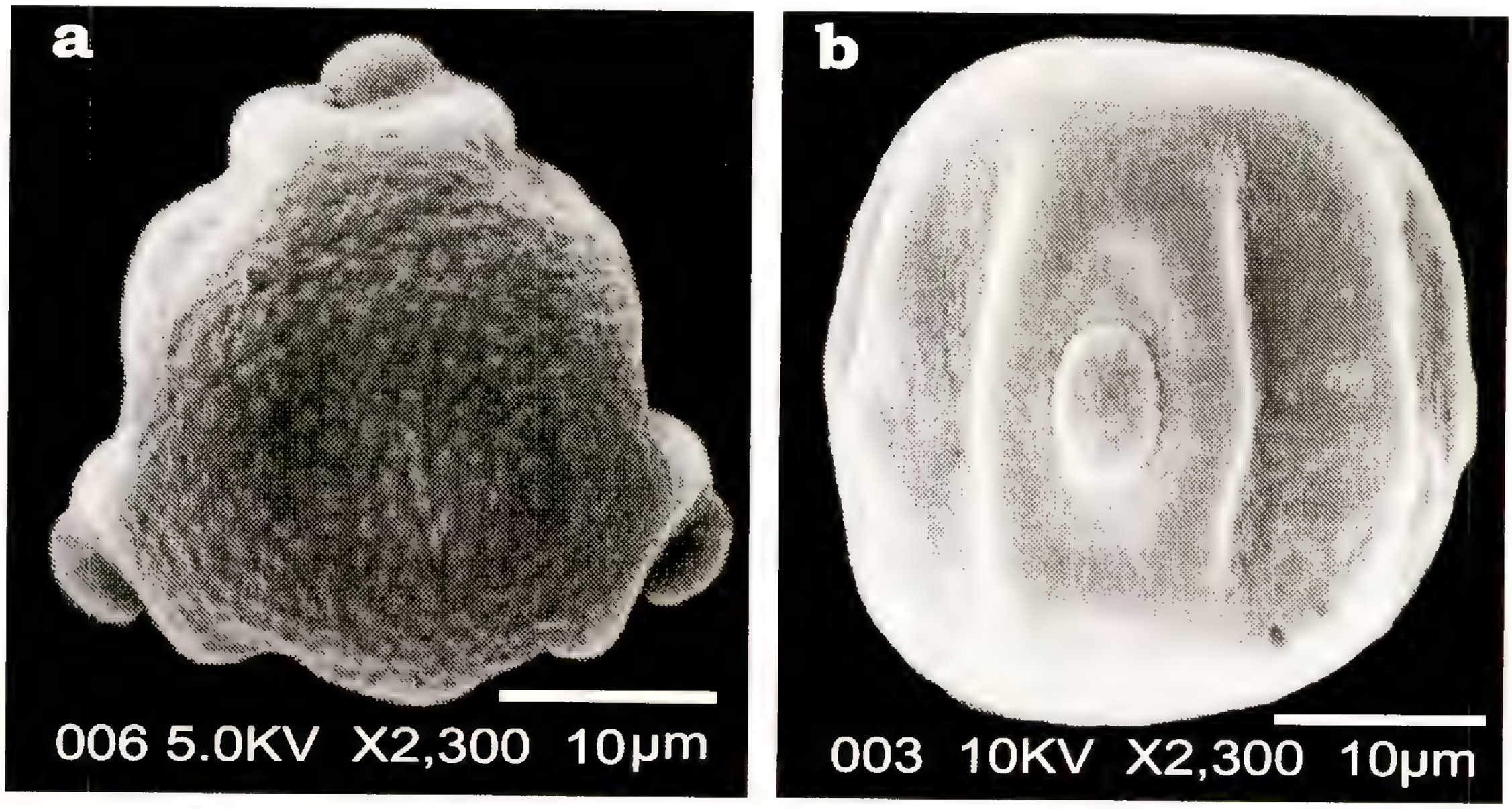

Figure 3. Micrographs of pollen grains. Polar (a) and equatorial (b) views; in the latter, a colporus is clearly visible in the center with deep pseudocolpi flanking both sides of the aperture. Scale bar: 10 microns.

reddish, finely striate, densely covered with white minute uncinate trichomes; internodes 4.7–7.6 cm long (Figs. 1b, 2e). Nodes reddened (60B) in sun-exposed stems, hay green to light tan on drying (152D). Stipules aciculate to narrowly lanceolate, thin, basifixed, spreading to appressed on drying, 2–3 × 0.7–1 mm, green, 3-nerved, margins sparsely ciliate. *Leaves* trifoliolate; leaflets green (137C), coriaceous, orbicular, mucronate, not variegated, primary veins prominent beneath, with a few straight or uncinate white trichomes, blade margins sparsely ciliate with white straight or uncinate trichomes; terminal leaflet symmetrical, orbicular on upper stems, slightly rhombic on lower portions (Fig. 1m, 2e), 28–35 × 32 mm (often wider in upper parts); lateral leaflets suborbicular to rounded truncate, often smaller than terminal leaflets, 10–26 × 16–30 mm. Petioles terete, canaliculate, spreading horizontally, green, 18–40 mm long, densely covered with minute white uncinate and straight trichomes. Petiolules terete, strongly canaliculate, green, 8–11 mm long, covered with minute white and a few straight trichomes. Basal pulvinus 2–2.5 mm long, reddish; distal pulvinus 2 mm long, greenish brown; pubescence as on the basal pulvinus and petioles. Lateral and terminal stipels minute, 0.75–1 mm long, aciecular, green, 1- to 3-nerved, margins sparsely ciliate. *Inflorescence* short, stout, curved, 1- to 1-noded pseudoraceme, lateral racemes producing only 1 or 2 flowers (Fig. 1b, 2e); peduncle terete, 8–13 cm long, rachis 1–6 cm long, sparsely to densely covered with minute white uncinate trichomes and a few straight hairs; primary bracts aciecular with upper margin entire to seldom divided or trifid, 1–1.5 mm long, green, strongly 3 to 5-nerved, sparsely to densely covered with straight white trichomes; pedicellar bracts filiform, yellow, 1–1.5 mm long, strongly 1-nerved, densely covered with white, straight hairs; pedicels terete, green, 3–5 mm long, densely covered with white, straight or uncinate trichomes; bracteoles aciecular, narrow, 1 mm long, 0-nerved, finely ciliate, light green, slightly reddened at base, white on drying, margin sparsely ciliate. *Flowers* papilionaceous, purple pink (81B) fading (85D), 2 for each secondary raceme (Fig. 1e, 2e); calyx round cupped, light green, base somewhat reddened, hirsute, calyx tube 3 mm long, the 3 lower calyx lobes triangular, 1 × 1 mm, the 2 upper lobes 0.5 × 1.5 mm, obtuse (Fig. 1f); corolla standard deep purple (82A) fading light purple, trapeziform, auricles much reflexed, outer face light purple (75D), glabrous with just a few straight short trichomes above, 10 × 7 mm, upper margin truncate, with a 1 mm, red-purple (59A) claw channel-shaped with two parallel, sigmoid callosities; the limb erect above a deep sinus; thickened at flexure (Fig. 1g); corolla wings spreading horizontally, deep purple (82B), obovate, subequal, blade 9 × 5 mm, outer margins slightly revolute, more so on the left wing, glabrescent with a few minute short straight hairs adjacent to the spur; claw linear, 4 mm long; the somewhat squared rounded spur slightly adhering to the keel (Fig. 1h); keel tubular in close spiral, white to yellow glabrous, 1 4/5 closed counterclockwise coils, ca. 11 mm long, 2 claws divided, 3 mm long, with

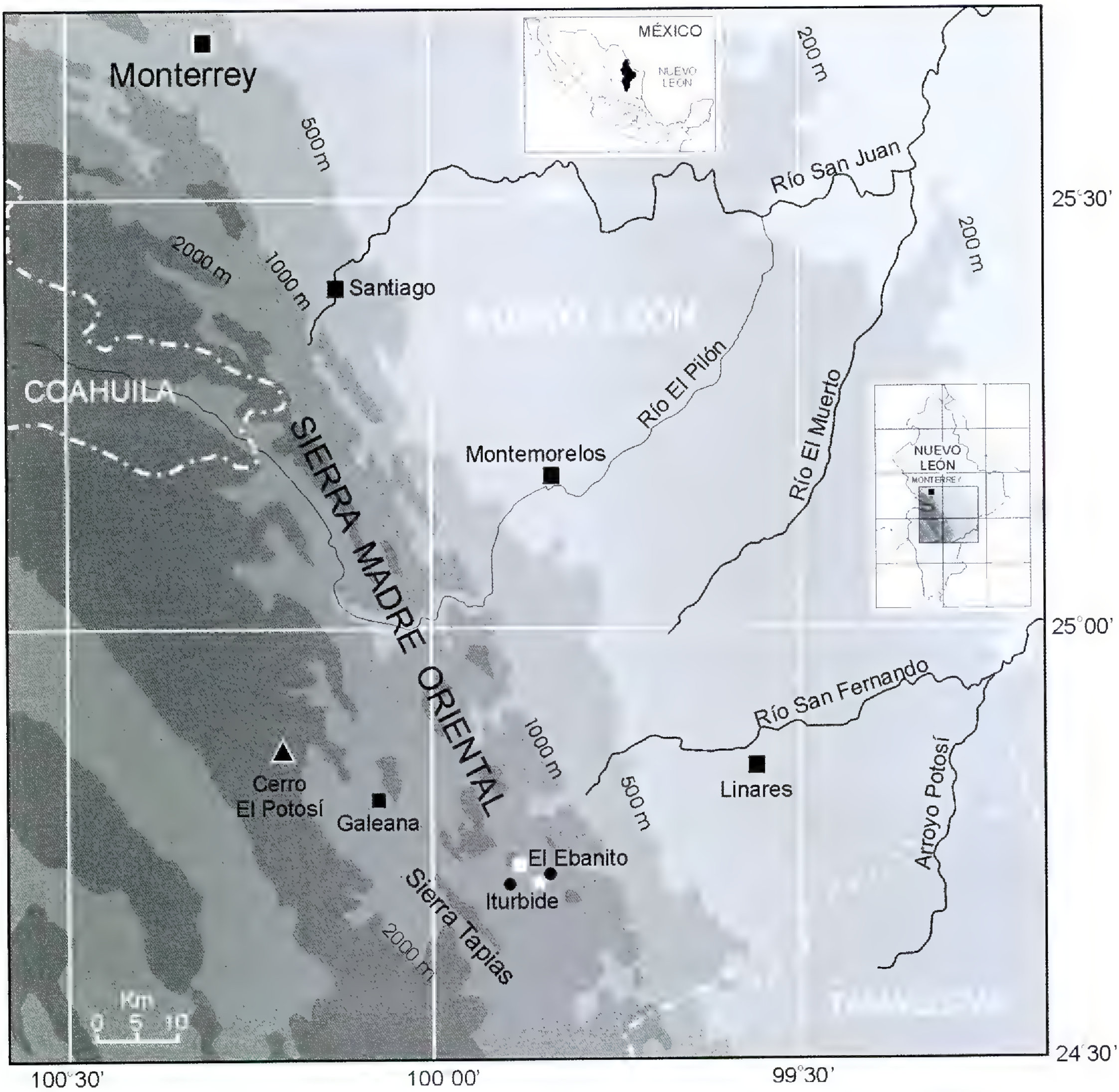

Figure 4. Distribution map for *P. novoleonensis* in northeastern Mexico (base map: Microsoft Encarta 2003). The white star refers to the type locality, while the white square refers to the paratype collection.

2 mm to flexure, pockets convex, rounded, 1 mm long, with few magenta spots toward the claw, pale yellow-green at apex (Fig. 1i); stamens diadelphous (9 + 1); vexillary stamen free, 10 mm long, claw terete, 2 mm to cupped knob, diameter 0.7 mm (Fig. 1k); staminal tube ca. 10 mm long, inconspicuously veined, appendages small and rounded (Fig. 1j); anthers oval, dorsifixed, dithecal, yellow; gynoecium with smooth basal disk, diameter ca. 1.5 mm; ovary green, slightly stipitate at base, laterally compressed, 3.7 mm long, smooth, glabrous, 3 to 4 ovules; style spiraled, ca. 10 mm long, with long fine white trichomes close to the stigma, not extending beyond it (Fig. 1l, 2f); stigma narrowly triangular, adaxially oriented, white, 0.8 mm long (Fig. 2f). *Pod* falcate, scimitar-like, 1 to 3-seeded (often with only the distal seed maturing), 25–35 × 9–11 mm, sutures finely demarcated, strongly dehiscent at maturity, drying tan, glaucous green (145C–143D), pod in mature development with fine, deep purple, sparsely distributed streaks and sutures reddish brown (165A) fading straw yellow (162A), beak 2 mm long (Fig. 1c, 2e). *Seed* oblong to lenticular, flattened, cream to light tan (164B–D), shiny, a few darker veins radiating from the hilum, 7–9 mm long, 4–6 mm wide, 3–5.5 mm thick; hilum elliptic, 1.3 mm long, a brown ring around the hilum; lens slightly raised (Fig. 1d, 2a). *Pollen* triangular (polar view), subprolate, tricolporate with 6 pseudocolpi, medium-sized, 30–35 µm diam., slightly breviaxed, poles slightly flattened; margins surrounding the colpi prominent, smooth, 3 µm wide; endoaperture elliptic (longer axis 7 µm); endoaperture membrane

smooth, ectoaperture membrane finely punctate; tectum finely punctate (Fig. 3a, b).

The above description has been made on holotype and isotype vouchers obtained from living plants grown at CIAT (Palmira, Colombia), which were grown from seed of the original seed collection. Small amounts of seed (accessioned as G10590) are available from the Genetic Resources Unit of CIAT. The following key, after the one by Freytag & Debouck (2002), integrates the new taxon into sect. *Coriacei* Freytag.

i. Leaflets rhombic, rounded to nearly ovate, not lobed at base; seed spherical to oblong, never lenticular.
  ii. Leaflets not particularly strongly veined; stipules more than 2–3 mm long; stems usually 2 m long or longer.
    iii. Leaflets mostly rhombic, usually obtuse; 1st leaves on new growth trifoliolate; pods straight to slightly falcate, heavily sutured, usually not stipitate and 2- to 4-seeded; seeds rounded, more than 7 mm thick; common, in mountains and high grasslands of S United States (from Texas to Arizona) to NW Mexico (down to Puebla), 500–2600 m . . . . . *P. maculatus* subsp. *maculatus*
    iii. Leaflets mostly ovate, usually acute; 1st leaves on new growth unifoliolate; pods usually falcate, finely sutured, usually stipitate and 3- to 5-seeded; seeds oblong, less than 7 mm thick; common, in mountains of SW United States to NW Mexico (down to Jalisco), 600–2600 m . . . . . *P. maculatus* subsp. *ritensis*
  ii. Leaflets strongly or distinctly veined; stipules 2–3 mm long; stems usually less than 2 m long.
    iv. Stipules triangular, aciculate; leaflets orbicular; primary bracts acicular, 1.5 mm long, 3-nerved; rare, in foothills of Sierra Madre Oriental of Central Nuevo León at about 800–1000 m . . . . . O. 2. *P. nuvoleonensis*
    iv. Stipules broadly ovate; leaflets rhombic-ovate; primary bracts orbicular, 3 mm long, strongly 5-nerved; rare, in grasslands of high plateaux of NE Jalisco and surrounding Aguascalientes and Zacatecas above 2000 m . . . . . O. 3. *P. reticulatus*

Geographic distribution. From the few specimens currently available, the species seems to be distributed on the eastern slope of Sierra Tapias (Fig. 1), and in other valleys along the eastern slope of Sierra Madre Oriental in the state of Nuevo León, Mexico, east of the regional divide (counties of Linares and Iturbide).

Ecology. The species has been found in *Quercus*, *Juglans*, and *Carya* forests in transition to tropical deciduous forest, on sunny and half shaded slopes, and on rocky soils (limestone, possibly Cretaceous) in mountain habitats (field notes, and Ferrusquía-Villafranca, 1993; Muller, 1939). It seems to be susceptible to spider mites. It appears to be the only species of the section in the northern range of Sierra Madre Oriental.

Etymology. The species is named after the state of Nuevo León in Mexico, the state to which it is confined.

Ethnobotany. The species is called "frijol de monte" by rural inhabitants in the county of Iturbide (personal observations, 1986); there are no reports about the use of its seeds.

Discussion. From the general morphology, it seems that *P. nuvoleonensis* belongs to the *Coriacei* section (Freytag & Debouck, 2002) and thus to the tertiary gene pool of lima bean (Maquet et al., 1999). With its sprawling stems and pluriannual fleshy root, the new species could be taken as a diminutive *P. maculatus* Scheele subsp. *maculatus*. It differs, however, from this subspecies by its small rounded leaflets (at least three times bigger in subsp. *maculatus*), by its short, curved, few-noded pseudoracemes, narrow primary bracts, falcate finely sutured pods, and flattened cream-colored seeds (Fig. 2a, b). In addition, the pollen pseudocolpi of *P. nuvoleonensis* contrast with those described for subsp. *maculatus* (Stainier & Horvat, 1985), being convex in the former. Similar to other taxa of the section (Freytag & Debouck, 2002), the standard is much reflexed, almost in the plane of the wings (Fig. 2e). Although it may also inhabit montane *Quercus* forests (Estrada & Martínez, 2000), *P. nuvoleonensis* differs from *P. maculatus* subsp. *ritensis* (Jones) Freytag by its first true leaves being trifoliolate, petiolate cophylls, small rounded leaflets, veined not speckled seeds (Fig. 2a, c), and few-noded pseudoracemes. Although both subspecies of *P. maculatus* are distributed in the western half of the Chihuahuan desert (Nabhan et al., 1980; Freytag & Debouck, 2002), west of the 100 W meridian in Mexico, *P. nuvoleonensis* is restricted to the northeastern part of this ecoregion. In contrast with the other species of the section *Coriacei* that thrive at high altitudes (Buhrow, 1983) and thus do not produce seed in Palmira, *P. nuvoleonensis* sets seeds there at 1000 meters in elevation, if pollen is brought on flower pistil, whereas it does not produce seeds in the Popayán station at 1800 meters above sea level.

Paratype. MEXICO. **Nuevo León:** Mpio. Linares, betw. settlements of El Ebanito & Los Pinos, 850 m, 28 Aug. 1986, *A. E. Estrada Castillón 633* (BRIT, CHAPA, MEXU 152011).

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Literature Cited

Anonymous. 1966. Royal Horticultural Society Colour Chart. The Royal Horticultural Society, London. Fans 2, 3, and 4.

Buhrow, R. A. 1983. The wild beans of southwestern North America. Desert Plants 5: 67–69, 82–88.

Delgado Salinas, A., T. Turley, A. Richman & M. Lavin. 1999. Phylogenetic analysis of the cultivated and wild species of *Phaseolus* (Fabaceae). Syst. Bot. 24: 438–460.

Estrada, C., A. E. & A. Martínez M. 2000. Legumes from the central part of the state of Chihuahua, Mexico. Sida 19: 351–360.

Ferrusquía-Villafranca, I. 1993. Geology of Mexico: a synopsis. Pp. 3–107 *in* T. P. Ramamoorthy, R. Bye, A. Lot & J. Fa (editors), Biological Diversity of Mexico: Origins and Distribution. Oxford Univ. Press, New York.

Freytag, G. F. & D. G. Debouck. 2002. Taxonomy, distribution and ecology of the genus *Phaseolus* (Leguminosae–Papilionoideae) in North America, Mexico and Central America. Sida 23: 1–300.

Maquet, A., X. Vekemans & J. P. Baudoin. 1999. Phylogenetic study on wild allies of lima bean, *Phaseolus lunatus* (Fabaceae), and implications on its origin. Pl. Syst. Evol. 218: 43–54.

Muller, C. H. 1939. Relations of the vegetation and climatic types in Nuevo León, Mexico. Amer. Midl. Naturalist 21: 687–729.

Nabhan, G. P., J. W. Berry & C. W. Weber. 1980. Wild beans of the greater Southwest: *Phaseolus metcalfei* and *P. ritensis*. Econ. Bot. 34: 68–85.

Piper, C. V. 1926. Studies in American Phaseolinae. Contr. U.S. Natl. Herb. 22: 663–701.

Stainier, F. & F. Horvat. 1985. Modifications de la structure fine de l'endexine au niveau de l'aperture chez *Phaseolus metcalfei* Woot. & Standl. et chez *Vigna unguiculata* (L.) Walpers subsp. *unguiculata* cv-gr. "biflora." Sci. Géol. Bull. Strasbourg 38(1): 121–130.

Wooton, E. O. & P. C. Standley. 1913. Descriptions of new plants preliminary to a report upon the flora of New Mexico. Contr. U.S. Natl. Herb. 16: 109–196.

Eight New Species of *Mandevilla* Lindley (Apocynaceae, Apocynoideae) from Brazil

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Abstract. Eight new species of *Mandevilla* Lindley are described and illustrated. The new species, six of them rare and endemic, occur in eastern Brazil. Three of the new species (*M. fistulosa*, *M. grazielae*, and *M. harleyi*) are shrubs growing on the upper slopes of granitic inselbergs in Minas Gerais and Espírito Santo in southeastern Brazil. Two species, *M. semirii* and *M. rubra*, are woody lianas growing on rock outcrops of quartzite in campo rupestre vegetation of Minas Gerais. *Mandevilla hatschbachii*, a distinctive shrub known only from three collections, occurs in the campo rupestre formations in eastern Brazil in Bahia. *Mandevilla guanabarica*, a suffrutescent liana generally misidentified as *M. funiformis* (Vellozo) K. Schumman, is found at the borders of the Atlantic rainforest in Espírito Santo and Rio de Janeiro. *Mandevilla dardanoi* is a small shrub endemic to Maciço da Borborema, in northeastern Brazil.

Resumo. Oito novas espécies de *Mandevilla* são aqui descritas e ilustradas. Estas espécies, seis das quais raras e endêmicas, ocorrem no leste do Brasil. Três espécies (*M. fistulosa*, *M. grazielae e M. harleyi*) são arbustos que ocorrem em inselbergs graníticos em Minas Gerais e Espírito Santo, no sudeste brasileiro. *Mandevilla semirii* e *M. rubra* são lianas lenhosas que ocorrem em afloramentos quartzíticos nos campos rupestres de Minas Gerais. *Mandevilla hatschbachii*, uma espécie arbustiva bastante peculiar e conhecida por apenas três coleções, ocorre nas formações de campo rupestre da Bahia. *Mandevilla guanabarica*, uma espécie de liana muitas vezes identificada erroneamente como *M. funiformis* (Vellozo) K. Schumman, ocorre nas bordas da Mata Atlântica do Espírito Santo e Rio de Janeiro. *Mandevilla dardanoi* é uma espécie arbustiva endêmica do Maciço da Borborema, no nordeste do Brasil.

Key words: Apocynaceae, Brazil, *Mandevilla*.

Mandevilla Lindley is one of the largest genera of Apocynaceae s. str. in the Neotropics and is characterized by the presence of colleters at the leaf base on the adaxial surface, racemose inflorescence, anthers with a slightly cordate to truncate base, and a style-head with five strongly projecting ribs (Simões et al., 2004). Variation in morphological aspects is diverse in the genus. Most species are vines, but shrubs, subshrubs, and even epiphytes are also known. The flower size and structure ranges from white, tubular flowers less than 1 cm long to brightly colored, infundibuliform flowers up to 9 cm long.

In the last monograph of the genus, Woodson (1933) recognized 108 species of *Mandevilla* distributed in two subgenera and five sections. Since then, a considerable number of species has been described, and the total number of species from the genus has now increased to about 140. Woodson (1933) cited 39 species for Brazil, and with the addition of other new species described since then (e.g., Woodson, 1936;

Markgraf, 1971a, 1971b) this number has increased by at least 10.

In order to investigate the diversity of *Mandevilla* in Brazil, a taxonomic revision of the Brazilian species of *Mandevilla* subg. *Mandevilla* Woodson, which corresponds to about one-third of the total species in the genus, was made (Sales, 1993). During this work, eight new species from southeastern and northern Brazil were found. Of these, all but *M. guanabarica* are closely associated with rocky substrates. Three species (*M. hatschbachii*, *M. rubra*, and *M. semirii*) are restricted to the quartzite outcrops of campo rupestre vegetation and four (*M. dardanoi*, *M. fistulosa*, *M. grazielae*, and *M. harleyi*) are narrow endemics endemic on inselbergs (large, isolated, dome-like granitic rock outcrops) of the Precambrian shields of Brazil, in Pernambuco in the northeast and Minas Gerais in the southeast. Both campo rupestre and even more so the inselbergs are inhospitable habitats characterized by thin, nutrient-poor soil and water scarcity combined with strong insolation from the exposed rock surface. Plants growing in these habitats usually have various adaptations to extreme conditions, including water-storing xylopods or stolons, fleshy stems, few leaves that are small and sclerophyllous or deciduous (Porembski & Barthlott, 2000; Löhne et al., 2004). Most of the species described herein exhibit one or more of these morphological adaptations.

1. Mandevilla dardanoi M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Pernambuco: Brejo da Madre de Deus, Prop. Bituri, 5 Feb. 1965 (fl, fr), *D. Andrade-Lima 4290* (holotype, IPA). Figure 1.

Mandevillae pohlianae (Stadelmeyer) A. H. Gentry et *M. widgrenio* Ezcurra forma corollae similis sed habitu frutescente suberecto ad scandens ramis longis flexuosisque, foliis 3-4-verticillatis 1.2–3.3 × 1.3–3.4 cm, laminis orbicularibus ad oblatas apicibus brevi-cuspidatis et inflorescentia axillari differt.

Shrub, with well-developed tuberous roots, latex white; branches subdecumbent to somewhat clambering, terete to subquadrangular, flexuous, brownish red, with slender, longitudinal lines, glabrous or strigose with the older part becoming glabrous; internodes 0.5–4.5 cm long; nodes with the leaf scars evident; nodal colleters interpetiolar, 4 to 6 per node, narrowly conic, deciduous in the older parts. Leaves whorled, 3 or 4 at each node, subappressed, subsessile; petiole terete, velutinous to tomentose, 1–2 mm long; blade slightly conduplicate, orbicular to oblate, sometimes broadly elliptic or elliptic-obovate, base obtuse to rounded, sometimes slightly cordate, apex very shortly cuspidate, slightly emarginate or emarginate-mucronate, subcoriaceous to coriaceous, 1.2–3.3 × 1.3–3.4 cm, adaxial surface glabrous to velutinous, midvein immersed and secondary veins 8 to 10, slightly immersed, abaxial surface glabrous to velutinous or velutinous-hirsute with the midvein salient and the secondary veins slightly salient; leaf colleters 2, located at the base of the midvein adaxially. Inflorescence racemose, axillary, 2- to 4-flowered, glabrous to glabrescent, 1.5–8.5 cm long; peduncle 1–1.5 cm long; bracts lanceolate, glabrous, margin ciliate in the upper half, 2–3 × 1–2 mm. Flowers showy, pedicellate; pedicel terete, slightly twisted, glabrous, 0.7–1.6 cm long; calyx deeply 5-parted, lobes ovate-lanceolate to lanceolate, apex acuminate, glabrous, margin ciliate in the upper half, 4–5 × 1.1–2 mm; calycine colleters numerous, forming a continuous ring at the base; corolla infundibuliform, pink to reddish, glabrous, 5.5–8 cm long, part below stamen insertion narrow, cylindrical, straight, 7–11 × 2–2.5 mm, expanded part above stamens narrowly conical, 33–44 × 10–15 mm, lobes suberect, obliquely obovate with one extremity rounded and the other acuminate, 14–22 × 12–21 mm; stamens subsessile; filaments ventrally woolly, ca. 1.5 mm long; anthers linear, apiculate, 6.5–6.8 mm long, base slightly cordate with the auricles 1 mm long; ovary oblong-ovoid, glabrous, 1.7–2 mm long; nectaries 2, alternate with the carpels, ca. 0.9 mm long; style terete, 10 mm long; style-head deltoid, 1.8–1.9 mm long, with 5 longitudinal ribs. Follicles 2, terete, glabrous, 9.5–14 cm long; seeds linear, ca. 4 mm long, comose; coma 13 mm long.

Habitat and distribution. This rare species is only known from a small region of Pernambuco, in northeastern Brazil, where it is endemic to the open grasslands and granitic inselbergs of the Maciço da Borborema, at altitudes above 400 m.

Phenology. Collected with flowers from November to February and with fruits in July and August.

Mandevilla dardanoi is easily recognized by the following set of characters: it is a small shrub with above-ground xylopods and stolons; it has long and slender branches bearing whorled, slightly conduplicate leaves; and it has a large, pink to reddish corolla, similar in form to that of *M. pohliana* (Stadelmeyer) A. H. Gentry. The leaves of *M. dardanoi* are somewhat similar to *M. moricandiana* (A. DC.) Woodson, being orbicular to oblate and slightly conduplicate, but *M. dardanoi* differs by its shrubby habit, striking above-ground xylopods and stolons (see Löhne et al., 2004, Fig. 1), and whorled phyllotaxis.

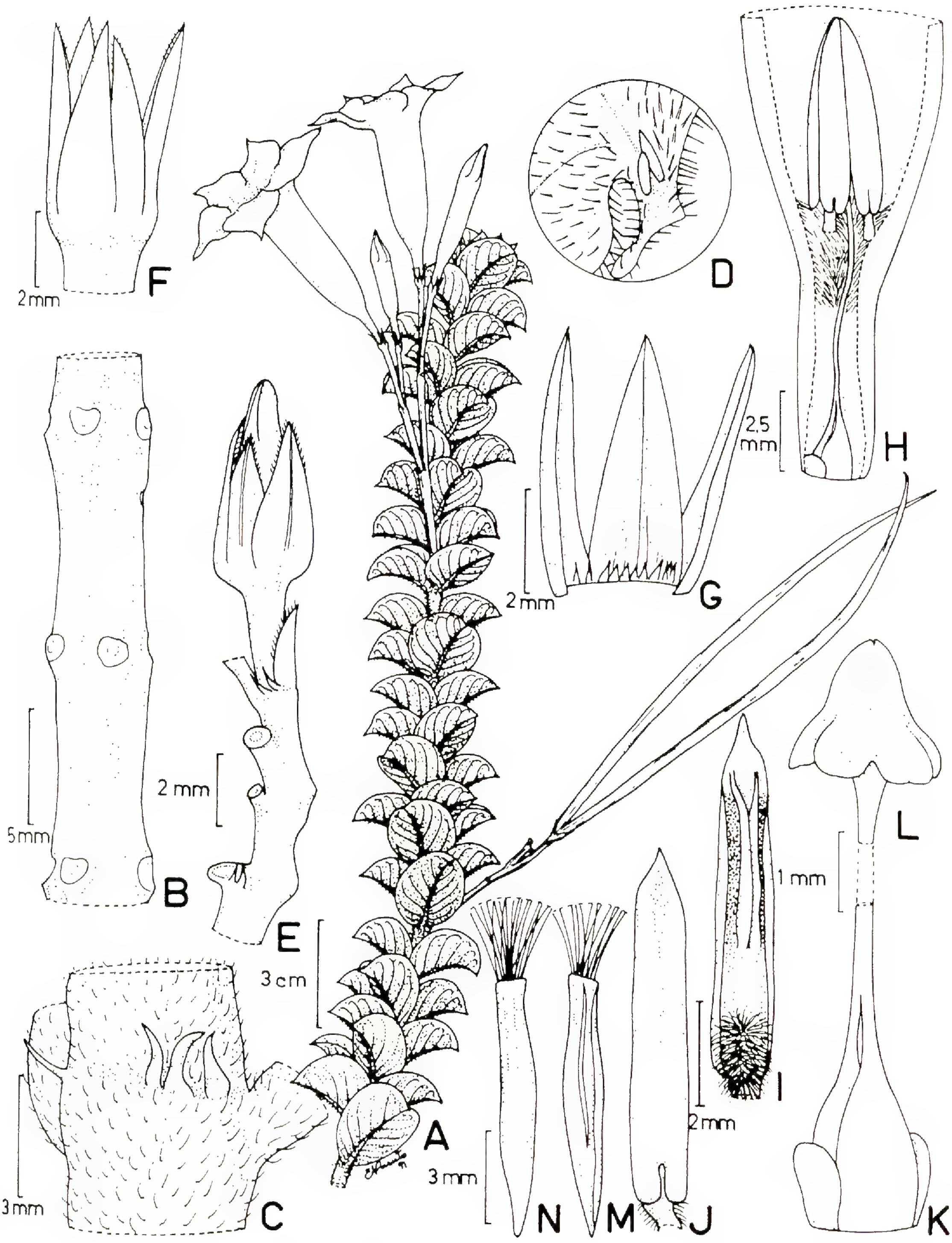

Figure 1. *Mandevilla dardanoi*. —A. Flowering branch. —B. Detail of a branch, showing leaf scars. —C. Nodal colleters. D. Detail of adaxial surface of leaf blade with two colleters at base. —E. Inflorescence axis showing colleters, bract, and a flower bud. —F. Calyx. —G. Adaxial surface of calyx lobes with continuous colleters at base. —H. Longitudinal section of flower showing stamens and gynoecium. —I. Anther in ventral view. —J. Anther in dorsal view. —K. Ovary and nectaries. —L. Style head. —M. Seed in hylar view. —N. Seed in anti-hylar view. (A. *Hatschbach 45769*, UEC; B-D. *Andrade Lima 59-3311*, IPA, UEC; E-N. *Perrucci 29*, IPA, UEC).

Etymology. This species is named in honor of Dardano de Andrade-Lima, a prominent botanist who has made significant contributions to the knowledge of the flora and biogeography of northeastern Brazil, and who is the collector of the type specimen.

Paratypes. BRAZIL. **Pernambuco:** Belo Jardim, Serra do Olho d'Água do Tatu, *D. Andrade-Lima 61-4005* (IPA, UEC); Bezerros, Serra Negra, *A. M. Miranda 2645* (HST, Universidade Federal Rural de Pernambuco, Brazil; UEC); Brejo da Madre de Deus, Faz. Nova, base da Pedra do Cachorro, *D. Andrade-Lima 55-1999* (IPA); Faz. Nova, Pedra do Cachorro, *D. Andrade-Lima 59-3344* (IPA, UEC); Prop. Bituri, Morro de Pedras, *D. Andrade-Lima 66-4877* (IPA, UEC); Faz. Bituri, *D. Andrade-Lima 73-7469* (IPA), *I. Pontual 66-334* (PEUFR), *A. M. Miranda 721* (PEUFR, UEC); Faz. Bituri, Campo de Faria, *A. Perruci & M. A. Maio Filho 29* (IPA, UEC); Poção, *B. Pickel 3520* (IPA); Buique, *A. M. Miranda 1762* (PEUFR, UEC); Quipapá, Usina Água Branca, Faz. Pelada, *D. Andrade-Lima 50-599* (IPA, UEC); Engenho Pelado, *C. G. Leal & O. A. Silva 232* (UEC); Maraial/Lagoa dos Gatos, *A. M. Miranda 1590* (PEUFR, UEC).

2. Mandevilla fistulosa M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Espírito Santo: São João de Petrópolis, mata da E. A. F. S. T., 11 Dec. 1985 (fl, fr), *H. Q. Boudet-Fernandes 1723* (holotype, MBML). Figure 2.

Manderillae funiformi (Vellozo) K. Schumann forma et corollae colore similis sed habitu frutescente erecto, 3 m alto ramis longis et fistulosis, petiolo brevi, 2–7 mm longo, foliis obovatis usque ad obovado-elliptica, alabastris apice longiacuminato et corolla 7–8 cm longa, tubo inferiore admodum cylindrico differt.

Erect shrub, up to 3 m high, latex white; branches terete, long, fistulose, glabrous; internodes 1–3 cm long; nodal colleters interpetiolar, triangular, fleshy, minute, 4 per node. Leaves decussate, subappressed, shortly petiolate; petiole terete, canaliculate, with trichomes along its entire length, 2–7 mm long; blade obovate to obovate-elliptic, rarely oblate, base obtuse to subcordate, apex emarginate-mucronulate, margin straight, membranous, 3.8–6.5 × 3–5.2 cm, adaxial surface glabrous, abaxial surface sometimes with trichomes at the base of the midvein; secondary veins 8 to 10, immersed on the adaxial surface and slightly salient on the abaxial surface; leaf colleter 1, conical, sometimes with trichomes at the apex, located at the base of the midrib adaxially. Inflorescence racemose, short, axillary, up to 6-flowered, glabrous, 0.6–3 cm long; peduncle terete, glabrous, 1–4 mm long; bracts broadly triangular, glabrous, margin ciliate, 1–1.8 × 1 mm. Flower bud with a long-acuminate apex; flowers showy, pedicellate; pedicel terete, glabrous, 12–15 mm long; calyx very short, forming a tube 1 mm long, 5-parted, lobes erect, triangular, apex acute to acuminate, 1–1.9 × 1 mm; calycine colleters opposite, 1 centered at the base of each lobe, deltoid, bi- or trifurcated at the apex; corolla infundibuliform, yellow, glabrous, 7–8 cm long, part below stamen insertion narrow, cylindrical, straight, 20–27 × 2–3 mm, expanded part above stamens campanulate, 20–25 × 17–20 mm, lobes somewhat reflexed, obliquely enlarged, ventrally tomentose, 20 mm long; anthers linear-oblong, 6–7.5 mm long, apiculate, base slightly cordate with auricles 0.5 mm long; ovary oblong, glabrous, 2.5 mm long; nectaries 5, completely fused and forming a ring surrounding the ovary, ca. 0.5 mm long; style terete, 20–25 mm long; style-head deltoid, 2–3 mm long, with 5 longitudinal ribs. Follicles 2, slightly moniliform, marked with longitudinal lines, glabrous, 15–25 cm long; seeds narrowly oblong, glabrous, 9–12 mm long and 1 mm wide, comose; coma 13 mm long.

Habitat and distribution. This rare and endemic species is known only from a narrow strip along the Atlantic Coast of Brazil in Espírito Santo and the extreme south of Bahia in Brazil, growing on rock outcrops of granitic inselbergs, in association with mat-forming Bromeliaceae at elevations of around 850 m.

Phenology. Collected with flowers and fruits from December to February.

Mandevilla fistulosa is closely related to a group of species (*M. funiformis*, *M. guanabarica*, and *M. harleyi*) that share a similar set of characters: large nodal colleters, sometimes similar to small stipules; leaf colleters flattened, bifurcate at the apex; inflorescence shortly racemose, with the peduncle very reduced (except in *M. funiformis*) and appearing corymbose; and with 5 calycine colleters opposite the calyx lobes. *Mandevilla fistulosa*, however, can be distinguished from *M. funiformis* and *M. guanabarica* by its shrubby habit and flower buds acuminate at the apex, and from *M. harleyi* by its short petioles and leaves obovate to obovate-elliptic with the apex emarginate-mucronate.

Etymology. The species epithet refers to its fistulose branches, which are characterized by having conspicuous longitudinal fissures.

Paratypes. BRAZIL. **Bahia:** Itamaraju, Faz. Pau-Brasil, *M. Carvalho & G. P. Lewis 897* (CEPEC, UEC); Pedra do Oratório, *R. S. Pinheiro 2038* (RB). **Espírito Santo:** Colatino, rod. Colatino–Vitória, *R. P. Belém 3822* (MO, NY); Ibiraçu, Morro da Vargem, 26 May 1990, *E. C. Gomes 1138* (UEC; VIES, Universidade Federal do Espírito Santo, Brazil); Nova Venécia, Serra de Cima, *A. P. Duarte 3999* (RB, UEC), *A. P. Duarte 9008* (UEC), *A. P. Duarte 14045* (RB); Pancas, *J. G. Kuhlmann 6647* (RB); Santa Tereza, Pedra Alegre, *H. Q. Boudet-Fernandes 2304* (MBML), *H. Q. Boudet-Fernandes 2310* (MBML); Vitória, Serra do Maruípe, 20 Mar. 1934, *J. G. Kuhlmann s.n.* (RB).

Figure 2. *Manderilla fistulosa*. —A. Flowering branch. —B. Detail of adaxial surface of leaf blade with one colleter at base. —C. Calyx and base of corolla. —D. Adaxial surface of calyx lobes with opposite colleters at base. —E. Longitudinal section of flower showing stamens and gynoecium. —F. Anther in ventral view. —G. Anther in dorsal view. —H. Ovary and nectaries. —I. Style head. —J. Seed in hylar view. (A, B, H, from the type *Boudet-Fernandes 1723*, MBML; C–G, I, J, *Carvalho 897*, CEPEC, UEC.)

3. Mandevilla grazielae M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Espírito Santo: Vale dos Pancas, ca. 60 km NO de Colatina, 100 m, 8 Sep. 1977 (fl, fr), *G. J. Shepherd, J. Semir, J. B. Andrade & V. Leite 5869* (holotype, UEC; isotype, U). Figure 3.

Haec species *Mandevillae duartei* Markgraf habitu frutescente et corollae forma affinis sed ramis gracilibus et fragilibus foliis petiolatis, petiolo 4–11 mm longo, lamina oblongo-lanceolato apice acuminato et calycis lobis praecociter deciduis differt.

Branched shrub, 1.5 m high, latex white; branches terete to somewhat angled, slender, reddish brown, glabrous to puberulous; internodes 1–4 cm long; nodal colleters interpetiolar, caducous, ca. 10 at each node, subulate, less than 1 mm long. Leaves decussate, petiolate; petiole terete, canaliculate, glabrous to velutinous, 4–11 mm long; blade straight, oblong-lanceolate, base rounded to subcordate, apex acuminate, margin straight, membranous, 5.5–10 × 1.2–3 cm, adaxial surface glabrous or pubescent to velutinous with conspicuous reticulate venation, secondary veins 20 to 28, almost parallel and forming a right angle with the midvein, abaxial surface glabrous or pubescent to velutinous, midvein salient; leaf colleters conical, minute, ca. 20 distributed along the petiole and leaf base. Inflorescence racemose, axillary, up to 4-flowered, glabrous, 7–9 mm long; peduncle 4–10 mm long; bracts triangular, scarious, caducous, 2 × 1 mm. Flowers showy, pedicellate; pedicel terete, glabrous to pubescent, slightly twisted; calyx 5-merous, caducous, even in flower buds, leaving the ovary exposed after its abscission, lobes lanceolate, apex acuminate, glabrous to puberulent, 2–4 × 1.2–1.5 mm; calycine colleters 2 to 3, alternate at the base of each lobe; corolla infundibuliform, purplish with the base cream, glabrous, 3.5–5 cm long, part below stamen insertion narrow, cylindrical, straight, 11–16 × 1.1–1.4 mm, expanded part above stamens turbinate, 28–30 × 23–27 mm, lobes oblong-ovate, spreading, 12–20 × 9–18 mm; stamens inserted at the base of upper corolla tube, subsessile, surrounded by a ring of long, thick, and subappressed trichomes 5 mm long; filaments woolly ventrally, ca. 1 mm long; anthers narrowly lanceolate, apiculate, 5.5–6.7 mm long, base slightly cordate with the auricles 0.9–1 mm long; ovary ovoid, glabrous, 1 mm long; nectaries 2, alternate with the carpels, oblong, ca. 1.2 mm long; style terete, 13 mm long; style-head conical, 2–2.2 mm long, with 5 longitudinal ribs. Follicles 2, slightly moniliform, glabrous, marked with slender, longitudinal lines, 6–11 cm long; seeds linear, densely covered by short, white-ferrugineous trichomes, 6.5–7.5 mm long, comose; coma 12–14 mm long.

Habitat and distribution. The species is known only from a restricted area in northern Espírito Santo, also reaching northeastern Minas Gerais in Brazil, where it occurs as a narrow edaphic endemic on rock outcrops of granitic inselbergs, sharing this similar habitat with other *Mandevilla* species, such as *M. duartei* Markgraf, *M. harleyi*, and *M. fistulosa*.

Phenology. Collected with flowers from July to March and with fruits from September to March.

The corolla structure and color of *Mandevilla grazielae* are very similar to that in *M. duartei*, but *M. grazielae* is easily recognized by its long, slender branches, leaves with the blade oblong-lanceolate and venation reticulate, and principally by the early caducous calyx lobes, even in flower buds.

Etymology. This species is named in honor of Graziela Maciel Barroso, one of the most prominent and active Brazilian botanists in the past four decades.

Paratypes. BRAZIL. **Espírito Santo:** Colatina, *A. P. Duarte 8877* (RB); Rio Pancas, *J. G. Kuhlmann 12* (RB), *J. G. Kuhlmann 6646* (RB); Nova Venécia, Serra de Cima, *A. P. Duarte 4003* (RB); Pancas, 1952, *R. Burle Max s.n.* (RB); sine loc., *E. A. Bueno & L. Emygidio 90* (R), *E. A. Bueno & L. Emygidio 91* (R); cultivada no Jardim Botânico, 1935, *J. G. Kuhlmann s.n.* (RB). **Minas Gerais:** Pedra Azul, *A. P. Duarte 8783* (RB), *G. Pabst & E. Pereira* 9438 (R, RB); Teófilo Otoni, BR-418, *G. Hatschbach, M. Hatschbach & J. M. Silva 52278* (MU).

4. Mandevilla guanabarica Casaretto ex M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Rio de Janeiro: "bahia do Rio de Janeiro," 1857, *G. Casaretto 1483* (holotype, G). Figure 4.

Mandevillae funiformi ramis subtilibus, foliis ovalibus et petiolis gracilibus, inflorescentiis corymbosis, floribus luteis, corolla tubo infero gibboso et tubo supero campanulato similis sed foliis trichomatibus tomentoso base venae centralis et parte petioli adaxialiter, inflorescentiis et floribus minoribus differt.

Suffrutescent vines, branched, latex white. Branches terete, twining, slender, glabrous, the younger ones sometimes tendril-like, brownish red, slightly striate; internodes 1.5–6.5 cm long; nodal colleters interpetiolar, 4 per node, broadly deltoid, minute. Leaves decussate, spreading, petiolate; petiole terete, slender, canaliculate, covered by a series of minute trichomes on the adaxial surface and by woolly-tomentose trichomes on the abaxial surface, 4–8 mm long; blade straight to slightly revolute, ovate, base subcordate to cordate, apex acuminate to long-acuminate, margin slightly revolute, membranous, 2.5–5.2 × 2–3.2(4.4) cm, adaxial surface glabrous,

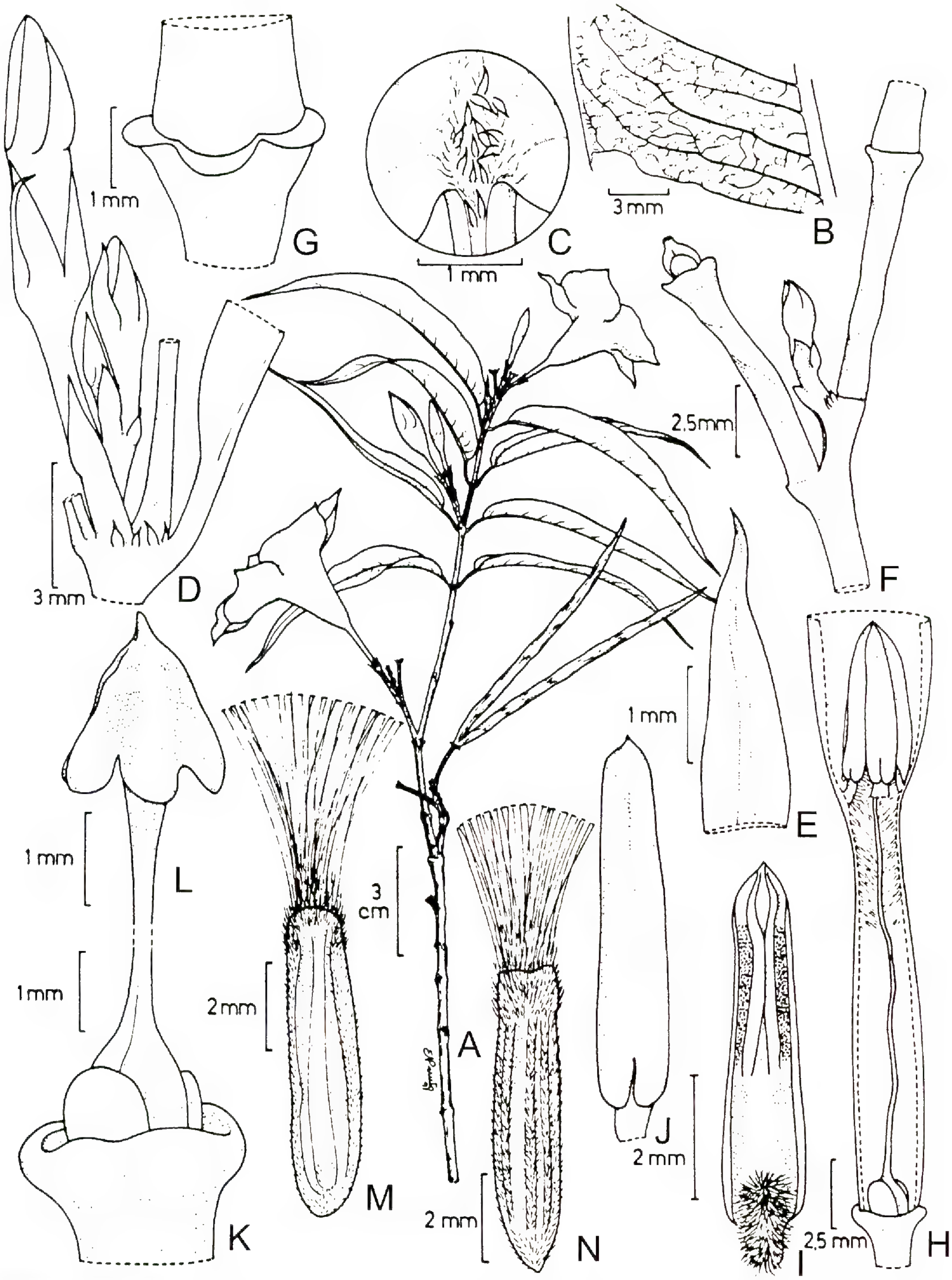

Figure 3. *Manderilla grazielae*. —A. Flowering branch. —B. Detail of abaxial surface of leaf blade showing venation. —C. Detail of adaxial surface of leaf blade with many colleters at base. —D. Inflorescence axis showing bracts and flower buds. —E. Adaxial surface of calyx lobe. —F. Detail of inflorescence showing exposed nectaries and ovary after calyx lobes abscission. —G. Detail of the scars of the calyx lobes after abscission. —H. Longitudinal section of flower showing stamens and gynoecium. —I. Anther in ventral view. —J. Anther in dorsal view. —K. Ovary and nectaries. —L. Style head. —M. Seed in hylar view. —N. Seed in anti-hylar view. (A–E. from the type *Shepherd et al. 5869*, UEC; F–N. *Kuhlmann 6646*, RB.)

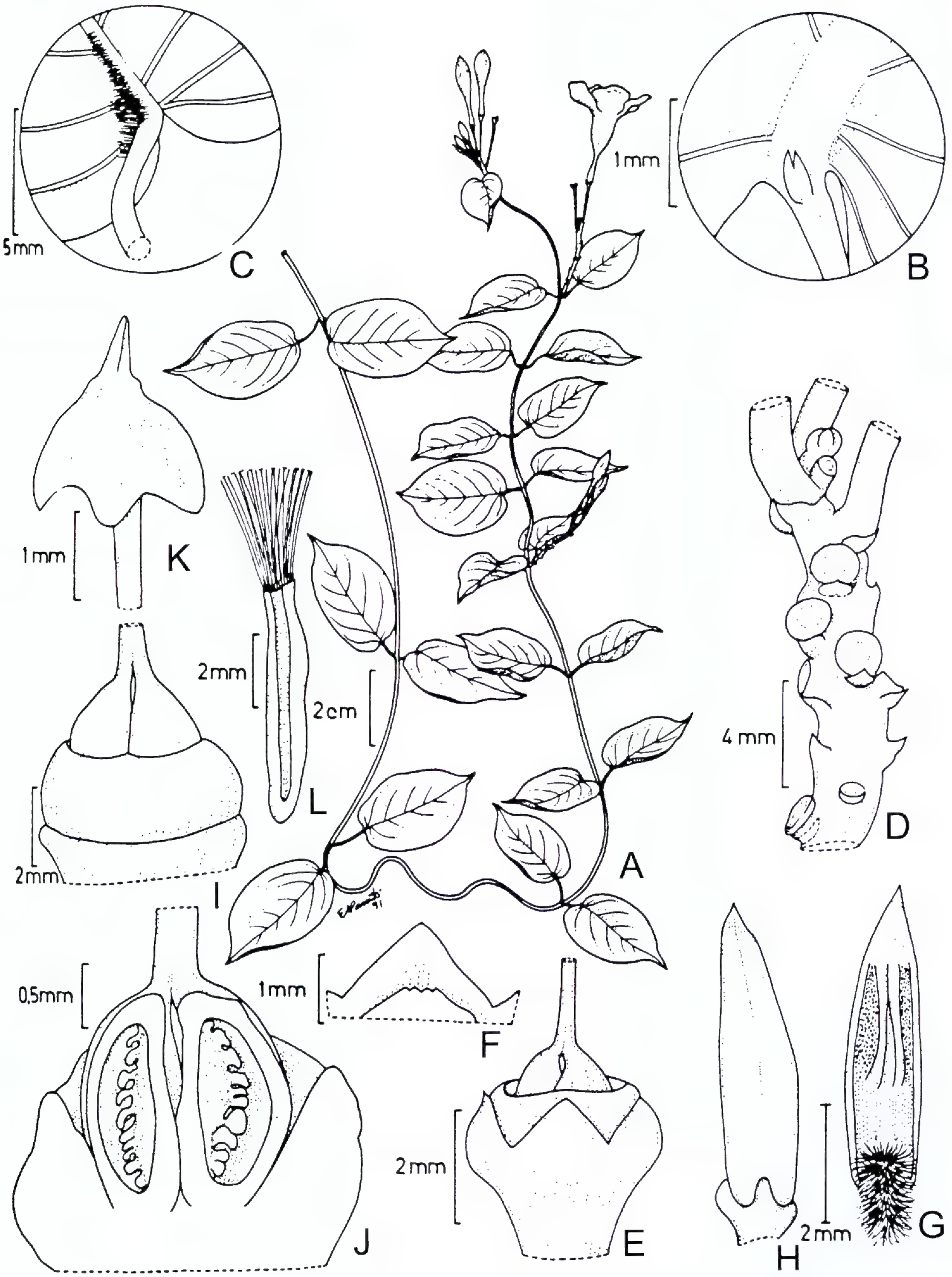

Figure 4. *Mandevilla guanabarica*. —A. Flowering branch. —B. Detail of adaxial surface of leaf blade with one colleter at base. —C. Detail of abaxial surface of leaf blade with trichomes at base and at the petiole. —D. Detail of inflorescence axis showing bracts. —E. Calyx, ovary, and nectaries. —F. Adaxial surface of calyx lobe with opposite colleter at base. —G. Anther in ventral view. —H. Anther in dorsal view. —I. Ovary and nectaries. —J. Longitudinal section of ovary and nectary. —K. Style head. —L. Seed in hylar view. (A–L. *Brade 16081*, RB, UEC.)

abaxial surface glabrous except for trichomes disposed along the middle portion of the midvein, sometimes reaching the upper half of the petiole; secondary veins 7 to 9, adaxially immersed; leaf colleter 1, ovate with a bifurcate apex, flattened, located at the base of the midvein adaxially. Inflorescence corymbiform, axillary, subsessile, 3- to 6-flowered, 0.6–2.6 cm long; peduncle 0.1–8 mm long; bracts deltoid, glabrous, 1 × 1 mm. Flowers showy, pedicellate; pedicel terete, glabrous, 0.9–1.2 cm long; calyx 5-parted, lobes deltoid, glabrous, margin ciliate, 1–1.5 × 1–1.5 mm; calycine colleters opposite, 1, centered at the base of each lobe, deltoid, flattened, bi- or trifurcate at the apex; corolla infundibuliform, yellow, slightly zygomorphic, 3.5–5 cm long, part below stamen insertion gibbous, somewhat constricted at about the middle, 10–15 × 2–3 mm, expanded part above stamens campanulate, 13–20 × 12–20 mm, lobes obliquely obovate-orbicular, 11–18 × 11–21 mm; stamens subsessile, inserted at the base of the upper corolla tube and surrounded by a tomentose ring of long, thick trichomes, 5 mm long; filaments laterally enlarged; anthers narrowly lanceolate, apiculate, 4.5–6 mm long, base slightly cordate, with the auricles 0.5 mm long; ovary oblong-ovoid, glabrous, 1.9–2 mm long; nectaries 5, forming a ring surrounding the ovary, 1 mm long; style terete, 10–12 mm long; style-head deltoid, 2–2.1 mm long, with 5 longitudinal ribs. Follicles 2, slightly torulose, slender, glabrous, 9–14 cm long; seeds linear-oblong, striate, 7–8 mm long, comose; coma 13–16 mm long.

Habitat and distribution. *Mandevilla guanabarica* is restricted to Rio de Janeiro and Espírito Santo, in southeastern Brazil. It occurs at the borders of shrubby or arborescent restinga formations, sometimes reaching the borders of the Atlantic rainforest.

Phenology. Collected with flowers from November to March and with fruits from April to August.

After a careful analysis of specimens identified as *Mandevilla funiformis*, we observed that some presented a distinct set of characters from this species and therefore should be segregated into a new species. We chose the epithet *guanabarica*, which was mentioned (Müller Argoviensis, 1860) for a specimen described as *Echites guanabarica* by Casaretto. The name *E. guanabarica* was written by Casaretto on one specimen at G, collected by him in 1857 in Rio de Janeiro. This collection, *Casaretto 1483*, possesses all the diagnostic characteristics of the new species. This ined. name and collection were later included under *Amblyanthera funiformis* var. *mycrophylla* by Müller Argoviensis (1860). Although it was never validly published, we decided to maintain the epithet *guanabarica* for the new species for two reasons: (1) it describes the location where the species occurs; and (2) because *Casaretto 1483* is well-preserved and has both flowers and fruits, making possible the examination of all diagnostic characters. Almost all specimens seen by us that have been identified as *M. funiformis* and were collected in the restinga and Atlantic rainforest formations of Rio de Janeiro are actually *M. guanabarica*. The two species are very similar, sharing the following set of characters: both are suffrutescent vines with slender, twining branches, sometimes tendril-like, having ovate leaves, yellow flowers disposed in axillary, corymbiform inflorescences and corolla with the expanded part above stamens campanulate. However, they can be distinguished by both morphological characters and geographic distribution: *Mandevilla guanabarica* occurs in the states of Rio de Janeiro and Espírito Santo in Brazil and has tomentose trichomes covering the abaxial surface of petiole and the leaf base, and shorter inflorescences, flowers, and stamens; *Mandevilla funiformis*, on the other hand, occurs more to the south (from southeastern to southern Brazil), is glabrous, and has longer inflorescences and flower parts.

Etymology. The species epithet refers to Guanabara, the official name of the Rio de Janeiro state in Brazil at the time when the holotype was collected (1857).

Paratypes. BRAZIL. **Espírito Santo:** Linhares, Res. Biol. de Comboios, *O. J. Pereira & L. C. Fabris 814* (UEC, VIES); Res. de Linhares, *D. Sucre 8383* (RB); Vitória, entre Vitória e Guarapari, *A. P. Duarte 4176* (RB, UEC); sine loc., Serra de Cima, *A. P. Duarte & E. C. Gomes 3926* (RB). **Rio de Janeiro:** Atafona, *A. L. Peixoto 559* (RB, UEC); Casemiro de Abreu, Rio das Ostras, *A. Souza, R. Esteves & V. Esteves 703* (R); Cabo Frio, Armação dos Búzios, *P. P. Jouvin 303* (RB); 1815, *Pohl s.n.* (BR); Praia do Pontal, *Segadas-Viana 1137* (GH), *D. Sucre 3829* (UEC); Cidade dos Meninos, Engenho do Rio Cambuabo, *C. Carcerelli 23* (RB); Macaé, restinga de Cabriúnas, *D. Araújo & N. C. Maciel 4277* (NY); Maricá, Lagoa do Padre, *D. Araújo & A. L. Peixoto 662* (RB, UEC); Barra de Maricá, *V. L. G. Klein 205* (RB, UEC), *K. Rodrigues & D. Daly 1267* (MO); entre o oceano e a Lagoa de Maricá, *L. R. Landrum 4182* (NY); Jacarepaguá, Pedra de Itaúna, *D. Araújo & A. L. Peixoto 715* (B), *H. C. Lima 1239* (RB, UEC), *D. Sucre 5005* (SP), *D. Sucre, G. M. Barroso & D. Dunn 6445* (RB, UEC), *W. N. Vidal 281* (RB, UEC); Recreio dos Bandeirantes, Senambetiba, *A. C. Brade 16081* (RB, UEC), *J. A. Jesus 1298* (RB, UEC); entre a litorânea e a BR-6, km 16, *A. B. Souza 69* (RB, UEC); Praia de Senambetiba, 23 00′S, 43 20′W, *L. B. Smith 6402* (NY), *A. Glaziou 4088* (C); Tijuca, 12 Mar. 1945, *D. O. Machado s.n.* (RB, UEC); Copacabana, 1887, *Schwaike s.n.* (R); Valença, 12 Aug. 1980, *L. A. Mattos-Silva, A. M. V. Carralho & J. L. Lage s.n.* (CEPEC, RB, UEC); sine loc., s.d., *A. Glaziou 9170* (C), *Lund s.n.* (C), *Riedel s.n.* (G), *Riedel s.n.* (A, W), *Schott 5400* (W); Tocaya, 1842?, *Schott s.n.* (BR).

5. Mandevilla harleyi M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Minas Gerais: Pedra Azul, estrada para Almenara, 16°08′S, 41°12′W, 800 m, 19 Oct. 1988 (fl), *R. M. Harley, B. L. Stannard, D. J. N. Hind, C. Kameyama, J. Prado, P. Rudall, R. Simão, N. Taylor & D. Zappi 25194* (holotype, SPF; isotypes, K, UEC). Figure 5.

Mandevillae fistulosae habitu frutescente 1.2–3 m alto coleteris stipulis similibus in caule persistentibus similis; sed foliis ovatis ad late elliptica basim versus rotundatis ad subcordata, corolla tenui, tubo inferiore admodum cylindrico 22–25 mm, fauce aperta et lobis 30–40 mm longis, expansis differt.

Erect, woody shrubs, 1.2–3 m high, latex white; branches terete, glabrous; internodes 0.4–2.3 cm long; nodal colleters interpetiolar, 4 per node, stipule-like, persistent, triangular, subcarnose, margin ciliate, ca. 1.5 mm long. Leaves decussate, subpatent, petiolate; petiole terete, canaliculate, glabrous, 0.8–1 cm long; blade straight, ovate to widely elliptic, base rounded to subcordate, apex acuminate to long-acuminate, margin straight, membranous, glabrous, 5–5.5 × 2–3.5 cm, secondary veins 8 to 10, abaxial surface with the midvein slightly thickened and salient and the secondary veins immersed; leaf colleter 1, oblong-ovate with the apex bifid and pilose. Inflorescence shortly racemose, terminal or axillary, 5- to 7-flowered, glabrous, 1–2.5 cm long; peduncle 1–7 mm long; bracts broadly deltoid, margin ciliate, 1 × 1 mm. Flower bud with a long-acuminate apex; flowers showy, pedicellate; pedicel terete, glabrous, 1–1.2 cm long; calyx reduced, 5-parted, lobes triangular, margin ciliate, 1.5–2 × 1 mm; calycine colleters opposite, 1 at the base of each lobe, deltoid, apex ciliate, almost the same size as the calyx lobe; corolla infundibuliform, yellow, glabrous, 7–9 cm long, part below stamen insertion slightly narrow, gibbous, 22–25 × 2–2.5 mm, expanded part above stamens campanulate, 24–35 × 23–25 mm, lobes spreading, slightly recurved, orbicular-obovate with one extremity acuminate and the other rounded, 30–40 × 35–36 mm; stamens subsessile; filaments laterally enlarged, ca. 2 mm long; anthers linear-lanceolate, long-apiculate, 8.5 mm long, base slightly cordate with the auricles 0.5 mm long; ovary ovoid, glabrous, ca. 2 mm long; nectaries 5, fused and forming a 5-lobed ring surrounding the ovary, 1 mm long; style-head deltoid, 3 mm long, with 5 longitudinal ribs. Follicles 2, terete, woody, glabrous, 9–13 × 0.3–0.4 cm; seeds oblong-linear, 8–11 mm long, comose; coma 13–15 mm long.

Habitat and distribution. This beautiful species, with its showy yellow flowers, is one of the most rare and poorly collected from the genus in Brazil and is strictly restricted to the rock outcrops of northeastern Minas Gerais in the vicinities of Pedra Azul and Medina, where it often appears to grow perched directly atop rocks. *Mandevilla harleyi* is only known from a few, isolated individuals on the upper slopes of granitic inselbergs.

Phenology. The flowering period seems to last for the whole year, and fruits can be found from December to August.

Mandevilla harleyi is a distinctive species, being closely related to a group of species (*M. fistulosa*, *M. funiformis*, and *M. guanabarica*) that share a suite of characters (as previously explained for *M. fistulosa*), but may be easily recognized by its longer petioles and flowers with the calyx disproportionately small in relation to the corolla size.

Etymology. This species is named in honor of Dr. R. M. Harley, a prominent botanist and collector who made significant contributions to the knowledge of the Brazilian flora, especially from its northeastern region, and who is the collector of the type specimen.

Paratypes. BRAZIL. **Minas Gerais:** Medina, Pedra da Onça, *Mendes Magalhães 15648* (MO); Pedra Azul, Vale do Jequitinhonha, *R. Burle Max apoc. 3* (SP), *A. O. Simões & R. B. Singer 1303* (UEC).

6. Mandevilla hatschbachii M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Bahia: Seabra, rod. BR-342, 10 km E de Seabra, 13 Oct. 1981 (fl, fr), *G. Hatschbach 44208* (holotype, MBM; isotypes, C, NY). Figure 6.

Mandevillae pycnanthae (Steudel) Woodson habitu frutescente corolla violacea hypocraterimorpha proxima sed ramis subcarnosis, foliis minoribus, 3–5.5 × 1.6–2.9 cm, coriaceis, revolutis, ellipticis ad anguste elliptica versus basim acutis ad obtusa et apicibus brevi-cuspidatis et floribus corollae tubo inferiore minus quam 11–13 mm differt.

Erect shrub, 1 m high, latex white; branches slightly angled, subcarnose, glabrous; internodes 0.7–3.5 cm long; nodal colleters interpetiolar, minute, deciduous in the older branches. Leaves decussate, subappressed, shortly petiolate; petiole terete, canaliculate, glabrous, 2–4 mm long; blade revolute, elliptic to narrowly elliptic, base acute to obtuse, apex shortly cuspidate, margin straight, coriaceous, glabrous, 3–5.5 × 1.6–2.9 cm; adaxial surface with the venation conspicuous, reticulate, midvein and secondary veins immersed, secondary veins 16 to 22, almost perpendicular and forming an angle close to 90° with the midvein, abaxial surface with the midvein salient and the secondary veins slightly raised; leaf colleters absent or sometimes 1 at the base

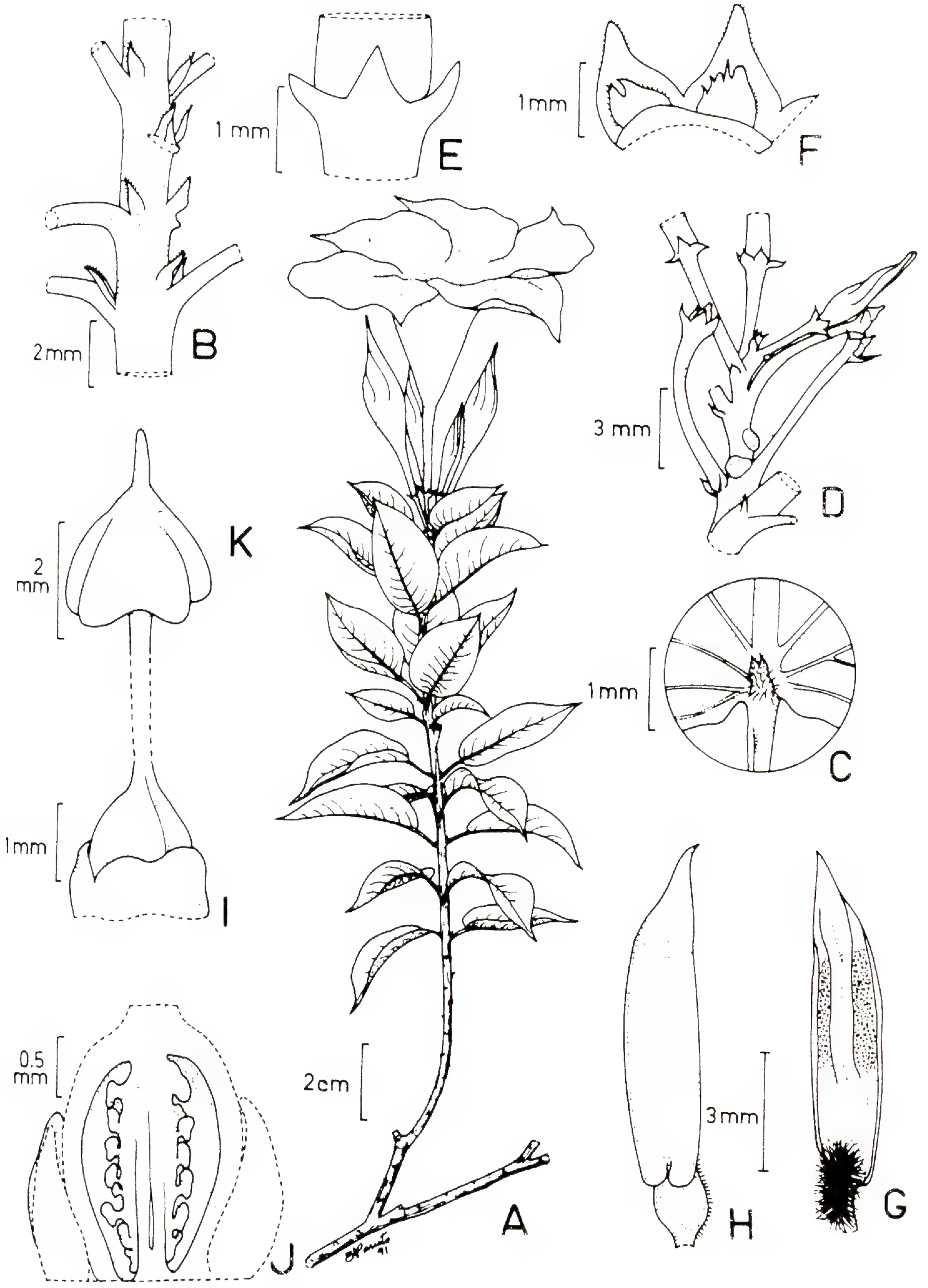

Figure 5. *Manderilla harleyi*. —A. Flowering branch. —B. Detail of a branch showing nodal colleters. —C. Detail of adaxial surface of leaf blade with one colleter at base. —D. Inflorescence axis, showing bracts and flower bud. —E. Calyx and base of corolla. —F. Adaxial surface of calyx lobes with opposite colleters at base. —G. Anther in ventral view. —H. Anther in dorsal view. —I. Ovary and nectaries. —J. Longitudinal section of ovary and nectaries. —K. Style head. (A–K, from the type *Harley et al. 25194*, K, SPF, UEC.)

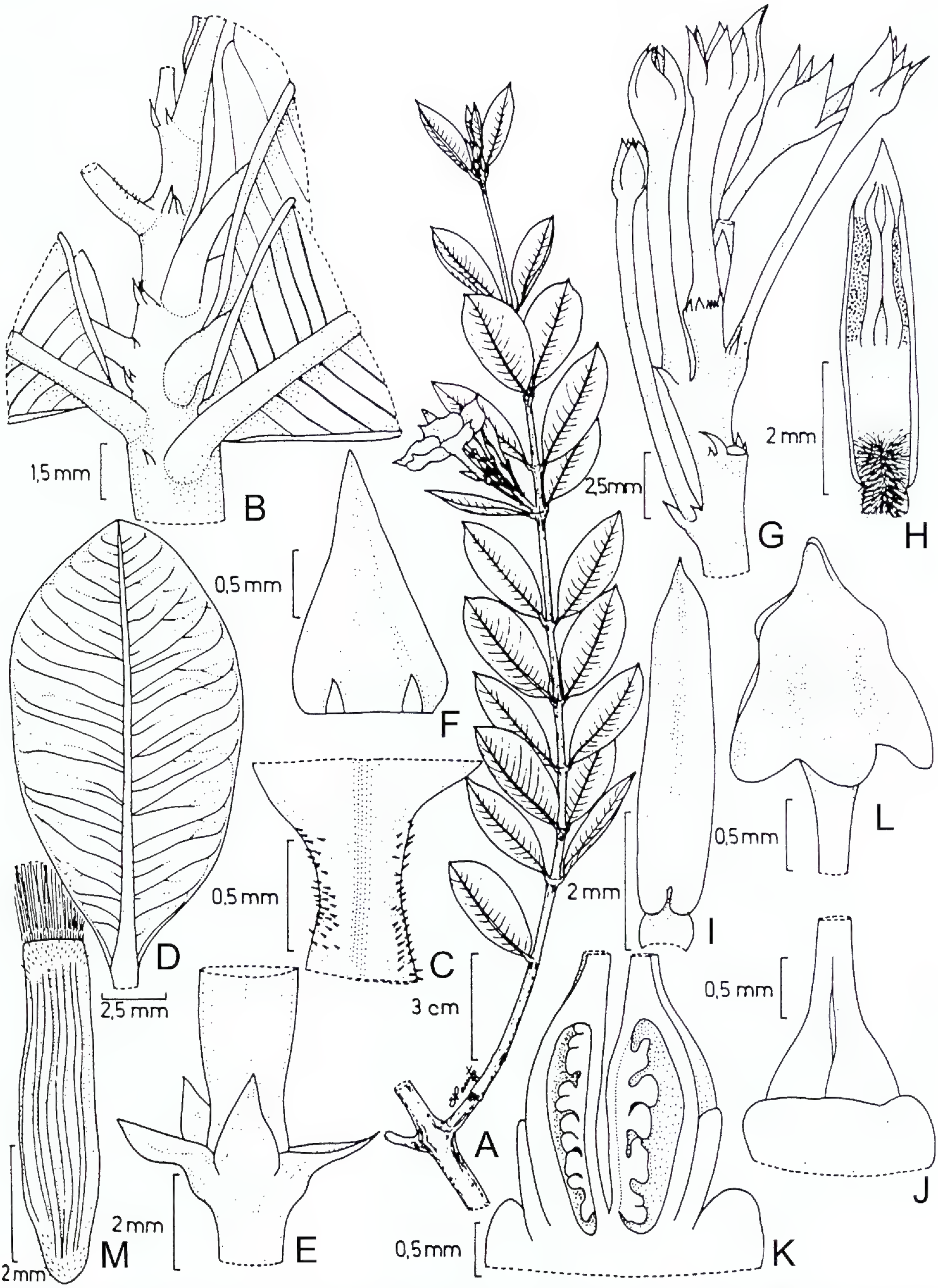

Figure 6. *Mandevilla hatschbachii*. —A. Flowering branch. —B. Detail of a branch, showing petioles and nodal colleters. —C. Detail of petiole with trichomes. —D. Adaxial surface of leaf blade. —E. Calyx and base of corolla. —F. Adaxial surface of calyx lobes with alternate colleters at base. —G. Inflorescence axis showing colleters, pedicels, and calyx. —H. Anther in ventral view. —I. Anther in dorsal view. —J. Ovary and nectary disc. —K. Ovary in longitudinal section. —L. Style head. —M. Seed in anti-hylar view. (A–M, from the type *Hatschbach 44208*, C, MBM, NY.)

midvein adaxially. Inflorescence racemose, axillary, 5-flowered, glabrous, 10–27 mm long; peduncle 1–8 mm long; bracts scarious, linear-lanceolate, glabrous, caducous, 1–1.5 × 0.5 mm. Flowers pedicellate; pedicel terete, glabrous, 7–11 mm long; calyx short, deeply 5-parted, lobes ovate with the apex acuminate, glabrous, membranous, 2–3 × 1.5–1.8 mm; calycine colleters 10, alternate, 2 at the base of each lobe; corolla salverform, glabrous, purple, 2.5–3 cm long, part below stamen insertion terete, 11 13 × 1.5–2 mm, expanded part above stamens narrowly tubular, 7–9 × 2.5–5 mm, lobes obovate, spreading, 8–12 × 9–12 mm; stamens subsessile; filaments ventrally woolly, 1 mm long; anthers linear, apiculate, 4.8–6 mm long, base slightly cordate with the auricles short, 0.4–0.5 mm long; ovary ovoid, glabrous, 1 mm long; nectaries 5, forming a 5-lobed ring surrounding the ovary, 0.5–0.6 mm long; style terete, ca. 14 mm long; style-head deltoid, 2 mm long, with 5 longitudinal ribs. Follicles 2, slightly moniliform, glabrous, 7–13.5 × 0.2 cm; seeds linear, covered by very short trichomes, 5–8 mm long, comose; coma 12–20 mm long.

Habitat and distribution. The species is endemic in Bahia, northeastern Brazil, in campo rupestre formations at altitudes above 1100 m.

Phenology. Collected with flowers in October and November and with fruits in October.

Mandevilla hatschbachii is easily recognized by its subcarnose branches and coriaceous leaves with the nearly parallel secondary veins forming a dense reticulation. The flower structure is similar to that of *M. pycnantha* (Steudel) Woodson, especially in terms of corolla size and number of nectaries (5), but the two species can be distinguished by the broadly elliptic to orbicular, rugose to slightly bullate leaves in *M. pycnantha*.

Etymology. The name of this species pays homage to Gert Hatschbach, one of the most profilic plant collectors in Brazil and collector of the type specimen.

Paratypes. BRAZIL. **Bahia:** Seabra, Serra do Bebedouro, 40 km de Seabra, *G. C. P. Pinto 122/83* (HRB); sine loc., s.d., *K. M. 1054* (RB).

7. Mandevilla rubra Markgraf ex M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Minas Gerais: km 118–119 da estrada Curvelo–Diamantina, 13 Dec. 1974 (fl), *N. L. Menezes & E. Froelich CFCR 1195* (holotype, SPF; isotype, UEC). Figure 7.

Liana sat singularis. A *Mandevilla atroviolacea* (Stadelmeyer) Woodson foliis ramis brevibus lateralibus dispositis, appendicibus nodis conspicuis, foliis brevi-petiolatis 1–4 mm longis, laminis 4.3–7.7 × 1.4–2.8 cm, oblongis ad ellipticae, base obtusis ad rotundatae, flore roseo-violaceo ad rubrum differt.

Woody liana, latex white, copious; branches twining, terete to slightly angled, glabrous, slightly striate; axillary branches ascending, short and leafy; internodes 9–16 cm long in the twining branches and 1–4 mm long in the axillary branches; nodal colleters narrowly conic, many, from minute to well developed, forming a ring surrounding the node, reflexed in the older branches. Leaves decussate forming a 45 angle with the stem, slightly imbricate, short-petiolate; petiole terete, canaliculate, 1–4 mm long; blade revolute, oblong to elliptic, base obtuse to rounded, apex acute to acuminate, margin straight, glabrous, coriaceous, 4.3–7.7 × 1.4–2.8 cm, adaxial surface with the midvein immersed, secondary veins 10, rather inconspicuous, tertiary veins conspicuous, abaxial surface with the midvein raised; leaf colleters 3, at the base of the midvein adaxially. Inflorescence racemose, axillary, up to 4-flowered, glabrous, 2.1–5.4 cm long; peduncle 1.8–4.2 cm long; bracts scarious, narrowly oblong, glabrous, caducous, 3.5 × 1 mm. Flowers showy, pedicellate; pedicel terete, glabrous, 0.8–1.8 cm long; calyx 5-parted, somewhat reddish, lobes lanceolate, apex acuminate, glabrous, 6–9 × 1.5–2.8 mm; calycine colleters many, forming a continuous ring at base; corolla infundibuliform, pinkish-lilac to reddish, glabrous, 5.5–7.5 cm long, part below stamen insertion straight, 12–16 × 2.8–3 mm, expanded part above stamens narrowly conical, 27–35 × 13–20 mm, lobes suberect, oblong-ovate, 16–24 × 13–20 mm; stamens subsessile; filaments flattened, ventrally woolly-tomentose, 3 mm long; anthers narrowly oblong, apiculate, 8.5 mm long, base slightly cordate with the auricles 1.3 mm long; ovary oblong, glabrous, 2.5 mm long; nectaries 2, alternating with the carpels, broadly oblong, flattened, ca. 1.2 mm long; style terete, 12 mm long; style-head conical, 2.8 mm long, with 5 longitudinal ribs. Fruits and seeds unknown.

Habitat and distribution. The species is endemic to a small region in Minas Gerais, Brazil, in campo rupestre formations of the Serra do Espinhaço above 1200 m, where it is known from only two localities, Gouvea and Curvelo.

Phenology. Collected with flowers in December and February.

The name *Mandevilla rubra* was written by Markgraf on one specimen (*Anderson, Stieber & Kirkbride 35397*) at NY, but was never published by

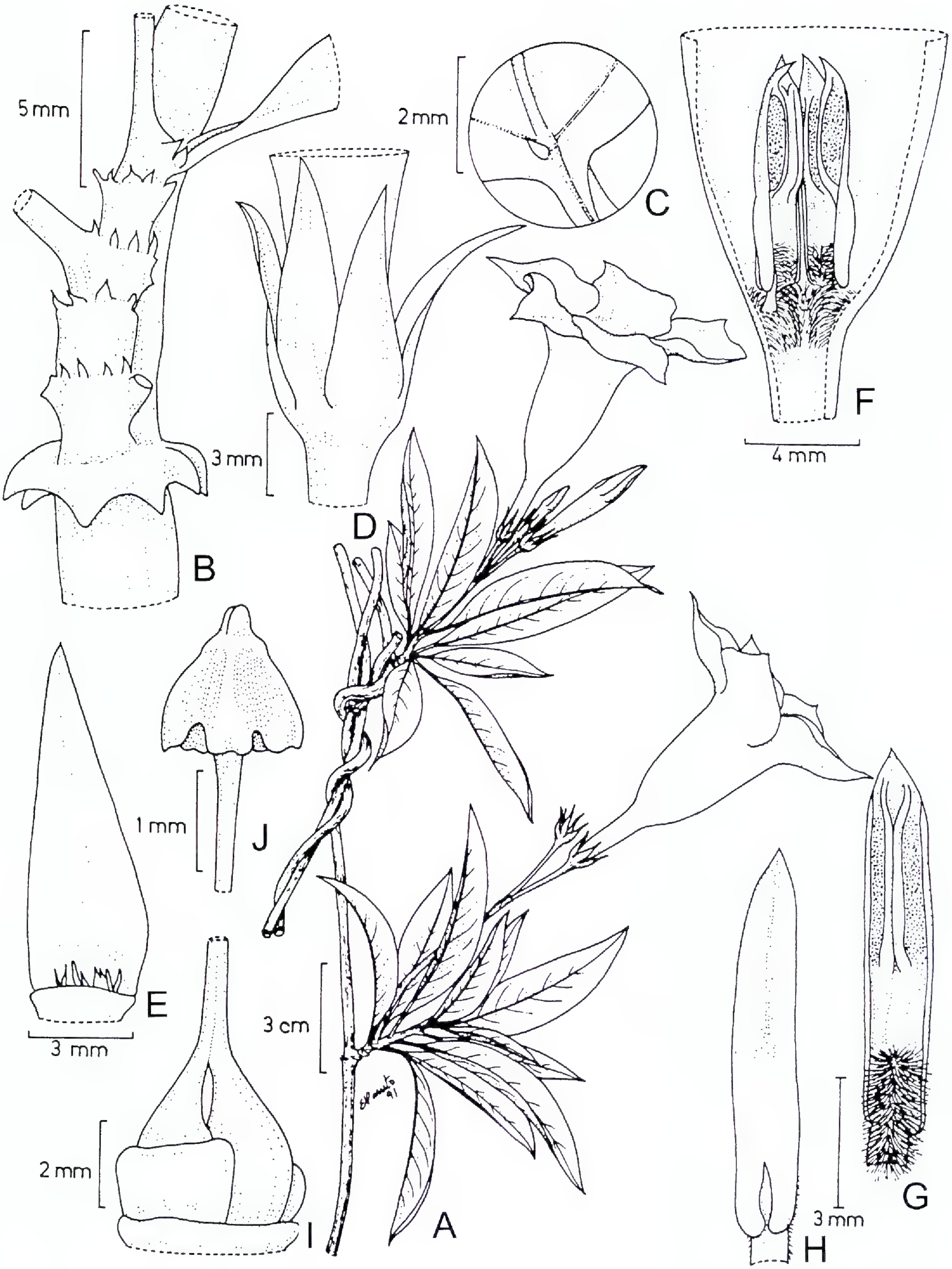

Figure 7. *Mandevilla rubra*. —A. Flowering branch. —B. Detail of branch showing nodal colleters. —C. Detail of adaxial surface of leaf blade with one colleter at base. —D. Calyx and base of corolla. —E. Adaxial surface of calyx lobe with continuous colleters at base. —F. Longitudinal section of flower showing stamens. —G. Anther in ventral view. —H. Anther in dorsal view. —I. Ovary and nectaries. —J. Style head. (A. *Anderson 35397*. NY; B–J. from the type *Menezes & Froelich CFCR 1195*, SPF, UEC.)

him. We agree with Markgraf's assessment, and an additional collection of this species (*Menezes & Froelich CFCR 1195*), at SPF and UEC, supports its recognition as a good species. *Mandevilla rubra* is an unusual species with two distinctive characters: it is a vine with the leaves on short lateral branches with very short internodes, and it has a narrowly conical upper corolla tube, similar to that of *M. pohliana*. Vegetatively, *M. rubra* is similar to *M. semirii* and *M. moricandiana*, but differs in that the tertiary veins are not conspicuously reticulate.

Etymology. The epithet *rubra* was originally attributed to this species by Markgraf (in sched.), and refers to the corolla color.

Paratype. BRAZIL. **Minas Gerais:** Gouvea, Serra do Espinhaço, ca. 8 km N de Gouvea na rod. para Diamantina, *W. R. Anderson, M. Stieber & J. M. Kirkbride 35397* (NY).

8. Mandevilla semirii M. F. Sales, Kinoshita-Gouvêa & A. Simões, sp. nov. TYPE: Brazil. Minas Gerais: Grão Mogol, 900–1000 m, 25 Feb. 1986 (fl), *J. Semir CFCR 9689* (holotype, SPF; isotype, UEC). Figure 8.

Species *Mandevillae moricandianae* magnitudine et forma foliorum proxima sed foliis basibus obtusis et rotundatis, corolla purpurea ad roseum , tubo inferiore breviore quam 8 - 10 mm, tubo superiore lato-conico, 16–20 mm longo et 14–20 mm diam, fauce et lobis expansis 20–31 mm longis differt.

Woody liana, latex white. Branches twining, thick, terete, glabrous to densely pubescent; lateral branches erect, subquadrangular with enlarged nodes and conspicuous leaf scars; internodes 2–7 mm long in the lateral branches; nodal colleters 10 to 12, continuous, conic, rigid, forming a ring surrounding the node, sometimes reaching 1.5 mm long. Leaves decussate, somewhat spreading, sometimes slightly conduplicate, subsessile; petiole terete, thick, canaliculate, glabrous to densely pubescent, 2–3 mm long; blade straight to slightly revolute, obovate-elliptic to obovate, sometimes oblong-obovate, base obtuse to rounded, apex shortly cuspidate to emarginate-mucronate, sometimes acuminate, coriaceous, glabrous to pubescent, 3–6.7 × 2.2–4 cm, adaxial surface with all veins slightly impressed, abaxial surface with the venation conspicuous, reticulate, secondary veins 7 to 13; leaf colleters 2 to 3, minute, conic, at the base of the midvein and sometimes reaching the petiole. Inflorescence racemose, axillary, lax, 8–22 cm long; peduncle 3.5–6.5 cm long; bracts scarious, lanceolate, caducous, 3 × 2 mm. Flowers showy, long-pedicellate; pedicel terete, slightly twisted, glabrous to pubescent, 1.3–2.5 cm long; calyx 5-parted, reddish, lobes narrowly lanceolate, apex acuminate, covered by scattered trichomes abaxially, 6–8 × 2 mm; calycine colleters many, forming 10 groups of 3 to 4 colleters each, alternate with the calyx lobes; corolla infundibuliform, purple to pink, 5–6 cm long, part below stamen insertion straight, short, 8–10 × 1.5 mm, expanded part above stamens broadly conical, 16–20 × 14–20 mm, lobes obovate-orbicular, expanded, 20–31 × 21–32 mm; stamens subsessile; filaments ventrally woolly, ca. 2 mm long; anthers linear-oblong, apiculate, 6.5 mm long, base slightly cordate with the auricles 1 mm long; ovary ovoid, glabrous, 1 mm long; nectaries 2, broadly oblong, fleshy, alternating with the carpels, 1.2 mm long; style terete, 8 mm long; style-head deltoid, 2 mm long, with 5 longitudinal ribs. Follicles 2, terete, glabrous, 9–10.5 cm long; seeds fusiform, flattened, 5 mm long, comose; coma 17 mm long.

Habitat and distribution. *Mandevilla semirii* is strictly endemic to a small region in northern Minas Gerais in Brazil, where it occurs in the upper portions (above 900 m high) of campo rupestre formations surrounding the adjacent localities of Grão Mogol and Itacambira.

Phenology. Collected with flowers from November to April and with fruits in April.

Vegetatively, *Mandevilla semirii* is very similar to *M. moricandiana* and *M. rubra* because of its lateral branches with very short internodes. However, it can be distinguished from both of these by the structure of the corolla with the expanded part above stamens broadly conical and longer than the part below stamen insertion.

Etymology. The name of this species pays homage to João Semir, one of the most prominent botanists in Brazil and the collector of the type specimen.

Paratypes. BRAZIL. **Minas Gerais:** Grão Mogol, *I. Cordeiro CFCR 845* (SPF), *F. Markgraf, H. L. Mello-Barreto & A. C. Brade 3486* (RB), *A. O. Simões, A. R. Barbosa, A. S. Flores, R. S. Rodrigues & R. Belinelo 1167* (UEC), *A. O. Simões, A. R. Barbosa, A. S. Flores, R. S. Rodrigues & R. Belinelo 1174* (UEC); Serra do Pipiri, *G. Hatschbach 42861* (B, UB), *R. Mello Silva CFCR 9011* (SPF); Itacambira, *M. L. Kawasaki CFCR 6595* (SPF, UEC).

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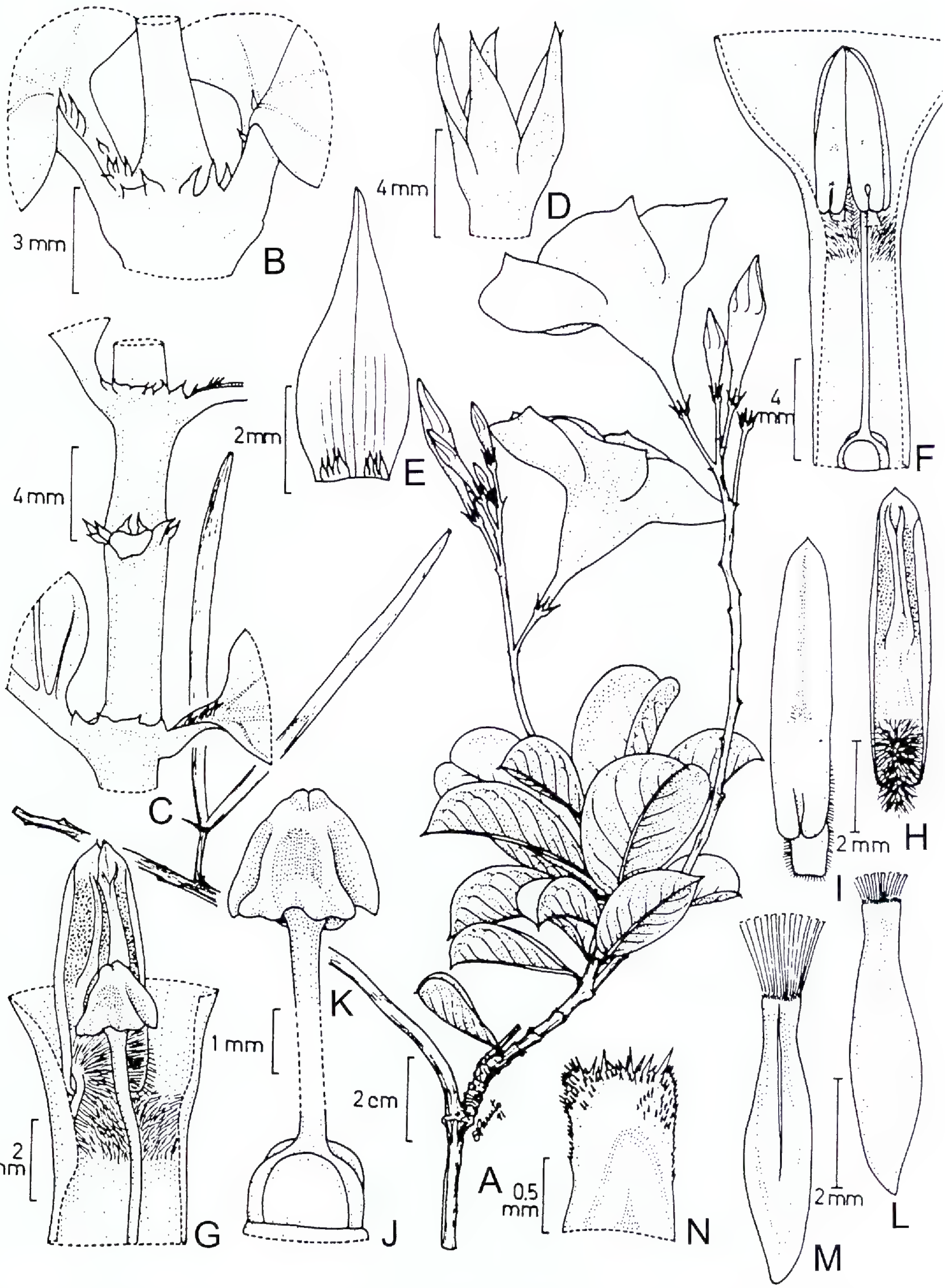

Figure 8. *Mandevilla semirii*. —A. Flowering branch. —B. Detail of a branch showing colleters at the node, petiole, and leaf blade. —C. Detail of a branch with nodal colleters. —D. Calyx. —E. Adaxial surface of calyx lobe with alternate colleters at base. —F. Longitudinal section of flower showing stamens and gynoecium. —G. Longitudinal section of flower showing stamens and style head. —H. Anther in ventral view. —I. Anther in dorsal view. —J. Ovary and nectaries. —K. Style head. —L. Seed in anti-hylar view. —M. Seed in hylar view. —N. Detail of seed apex with trichomes. (A, L–N, *Hatschbach 42861*, B, UB; B, C, from the type *Semir CFCR 9689*, SPF, UEC; D–K, *Mello-Silva CFCR 9011*, SPF.)

MBM, MBML, MO, MU, NY, PEUFR, R, RB, SP, SPF, U, UB, UEC, VIES (Universidade Federal do Espírito Santo, Brazil), and W for specimen loans as well as access to their collections.

Literature Cited

Löhne, C., I. C. Machado, S. Porembski, C. Erbar & P. Leins. 2004. Pollination biology of a *Mandevilla* species (Apocynaceae), characteristic of NE-Brazilian inselberg vegetation. Bot. Jahrb. Syst. 125: 229–243.

Markgraf, F. 1971a. Uma nova *Mandevilla* (Apocynaceae) do Brasil. Bradea 1: 35.

———. 1971b. *Mandevilla norocapitalis* Markgr. n. sp. Bradea 1: 49–51.

Müller Argoviensis, J. 1860. Apocynaceae. *In:* C. F. P. Martius & A. G. Eichler (editors), Flora Brasiliensis. Vol. 6, pt.1–2. Frid. Fleischer, Lipsiae.

Porembski, S. & W. Barthlott (editors). 2000. Inselbergs. Biotic Diversity of Isolated Rock Outcrops in Tropical and Temperate Regions. Springer-Verlag, Berlin-Heidelberg.

Sales, M. F. 1993. Estudos Taxonômicos de *Mandevilla* Lindley Subgênero *Mandevilla* (Apocynaceae) no Brasil. Ph.D. Dissertation, Universidade Estadual de Campinas, Campinas, Brasil.

Simões, A. O., M. E. Endress, T. van der Niet, L. S. Kinoshita & E. Conti. 2004. Tribal and intergeneric relationships in Mesechiteae (Apocynaceae, Apocynoideae): Evidence from three non-coding plastid DNA regions and morphology. Amer. J. Bot. 91: 1409–1418.

Woodson, R. E. 1933. Studies in the Apocynaceae. IV—The American genera of Echitoideae. Ann. Missouri Bot. Gard. 20: 605–790.

———. 1936. Studies in the Apocynaceae. IV—The American genera of Echitoideae. Ann. Missouri Bot. Gard. 23: 381.

Guianodendron, a New Genus of Leguminosae (Papilionoideae) from South America

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Abstract. The new genus *Guianodendron* Schütz Rodrigues & A. M. G. Azevedo (Leguminosae, Papilionoideae, Sophoreae) from Guyana and the Brazilian state of Amazonas is described and illustrated, and a new combination, *Guianodendron praeclarum* (Sandwith) Schütz Rodrigues & A. M. G. Azevedo, is made. The genus is characterized by a radial corolla with auriculate petals; five stamens; reduced ovule number; a straight hypanthium; indehiscent, flattened, and sutural-winged fruits; persistent bracts and bracteoles; leaflets with a papillate abaxial epidermis; and ovate to ovate-elliptic markedly striate stipules.

Resumo. O gênero novo *Guianodendron* Schütz Rodrigues & A. M. G. Azevedo (Leguminosae, Papilionoideae, Sophoreae), ocorrente na Guiana e no estado brasileiro do Amazonas, é descrito e ilustrado e uma nova combinação é feita, *Guianodendron praeclarum* (Sandwith) Schütz Rodrigues & A. M. G. Azevedo. O gênero é caracterizado por apresentar corola radial com pétalas auriculadas, cinco estames, número reduzido de óvulos, hipanto reto, frutos indeiscentes, achatados, com suturas aladas, brácteas e bractéolas persistentes, folíolos com epiderme abaxial papilosa e estípulas oval ou oval-elípticas, marcadamente estriadas.

Key words: *Acosmium*, Brazil, *Diplotropis*, *Guianodendron*, Guyana, Leguminosae—Papilionoideae.

Acosmium praeclarum (Sandwith) Yakovlev is a medium-sized to tall tree reaching 35 m, recorded until now exclusively from Guyana, where it is considered a major timber tree (Polak, 1992). During the course of a revision of the Neotropical legume genus *Acosmium* Schott (Leguminosae, Papilionoideae, Sophoreae), it became evident that *A. praeclarum* differs markedly from the remaining species in several vegetative and floral characters, indicating that these taxa might not be congeneric. This was previously observed by Sandwith (1947), who pointed out that anomalous characters of the species (as *Sweetia praeclara* Sandwith) could justify the creation of a new legume genus. Later, Yakovlev (1969) included *Acosmium praeclarum* in his monospecific *Acosmium* sect. *Praeclara* Yakovlev, which was characterized by five stamens and punctate leaflets. In addition, our morphological analysis showed that it differs from all other *Acosmium* species in having auriculate petals, a reduced ovule number (1, rarely 2), persistent bracts and bracteoles, leaflets with a papillate abaxial epidermis, as well as ovate to ovate-elliptic markedly striate stipules. Studies on the seedling morphology of *Acosmium* (Rodrigues & Tozzi, in prep.) reveal that *A. praeclarum* may be distinguished by possessing cryptohypogeal seedlings (Polhill, 1981).

The combination of these characters does not fit comfortably within any known papilionoid genera (Lewis et al., 2005), and therefore a new South American genus, *Guianodendron*, is described herein.

Guianodendron Schütz Rodrigues & A. M. G. Azevedo, gen. nov. *Acosmium* sect. *Praeclara* Yakovlev, Notes Roy. Bot. Gard. Edinburgh 29: 355. 1969. TYPE: *Guianodendron praeclarum* (Sandwith) Schütz Rodrigues & A. M. G. Azevedo. Figure 1.

Arbores Leguminosae Papilionoideae tribui Sophoreis pertinentes. Hoc genus petalis subaequalibus, laminis sagittatis auriculis inflexis carnosis, staminibus 5 liberis, hypanthiis rectis, bractis bracteolisque persistentibus, stipulis ovatis vel ovato-ellipticis striato-nervosis, ovulis 1 (raro 2), leguminibus indehiscentibus applanatis alato-marginatis distinctum.

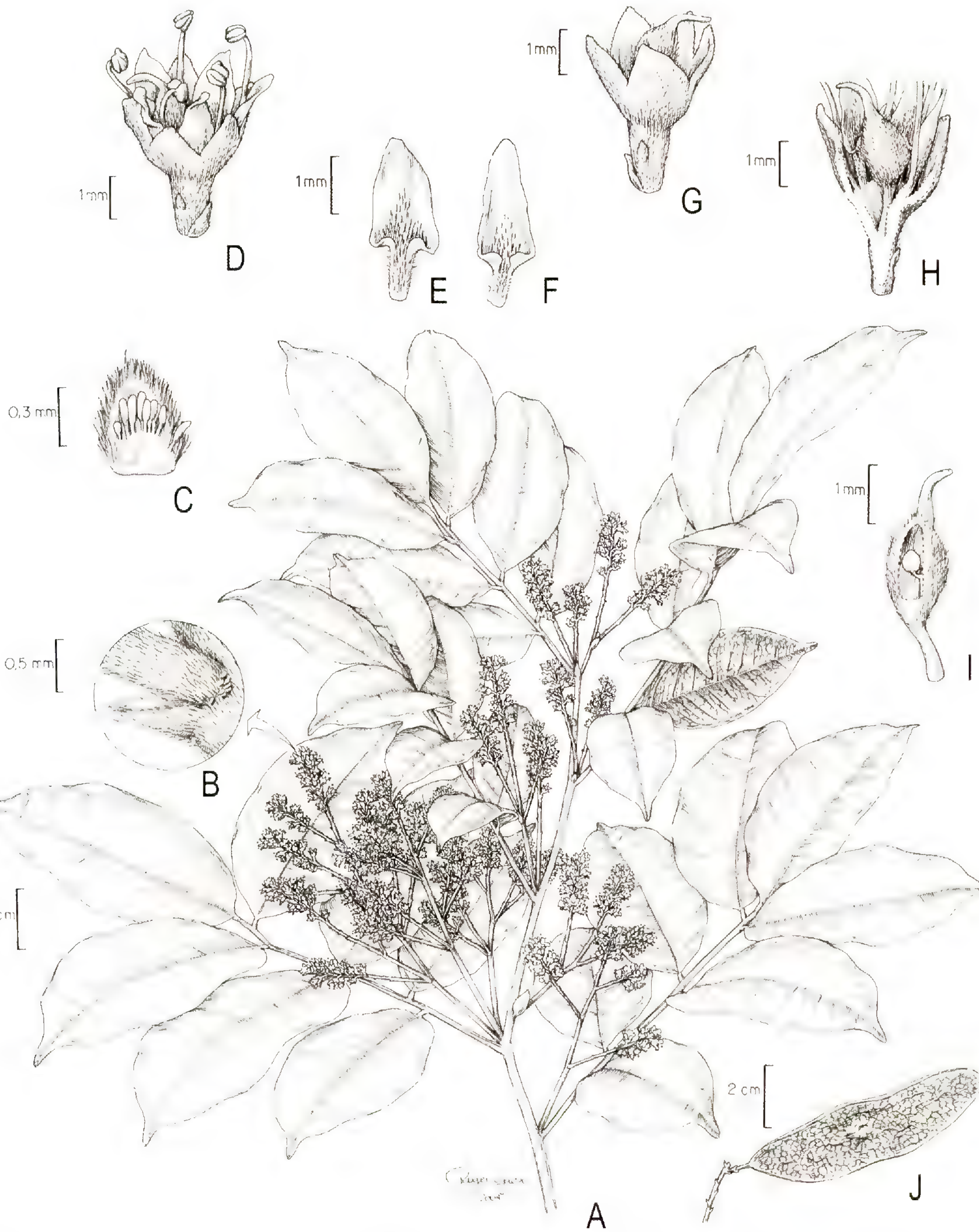

Figure 1. *Guianodendron praeclarum* (Sandwith) Schütz Rodrigues & A. M. G. Azevedo. —A. Flowering branch (*S. S. & C. L. Tillett 15433*). —B. Detail of glands clustered at flower axils. —C. Detail of glands clustered at bracteole axils. —D. Flower. —E. Standard petal. —F. Wing petal. —G. Flower without petals and anthers. —H. Flower in longitudinal section, showing the hypanthium. —I. Ovary in longitudinal section, showing the single ovule. —J. Fruit, with persistent bracts (*D. B. Fanshawe in Forest Dept. 3286*). [Drawings from the NY isotype *Aitken in For. Dept. 2353* unless otherwise noted].

Guianodendron praeclarum (Sandwith) Schütz Rodrigues & A. M. G. Azevedo, comb. nov. Basionym: *Sweetia praeclara* Sandwith, Contr. Gray Herb. 165: 25. 1947. *Acosmium praeclarum* (Sandwith) Yakovlev, Notes Roy. Bot. Gard. Edinburgh 29: 355. 1969. TYPE: Guyana. Essequibo River: Makauria Creek, 1 Mar. 1934 (fl), *Aitken in For. Dept. 2353* (holotype, K not seen, photos of holotype neg. 2805 at F, NY; isotype, NY). Figure 1.

Trees to 35 m, with obtriangular crown, base buttressed, trunk to ca. 50 cm DBH, bark light brown, lenticellate; branchlets glabrescent. Stipules ovate to ovate-elliptic, markedly striate, 4–10 × 2–5 mm, caducous. Leaves alternate, imparipinnate, 5- to 9-foliolate, petiole and rachis glabrous, canaliculate along upper side, petiole 1.8–3.5 × 0.15–0.2 cm, rachis 3.6–7.5 cm long; petiolules glabrous, plicate, 2.5–4.5 × 1.2–2 mm; leaflets alternate or opposite, 4.8–14 × 2.3–6 cm, elliptic, oblong to obovate, concolorous, glabrous above, strigillose and black punctate beneath, apex acuminate or acute, base cuneate or obtuse, venation brochidodromous, costa sunken above, slightly prominent beneath, secondary veins 8 to 14 pairs, slightly prominent on both surfaces, forming an angle of 50°–65° with the leaflet costa. Inflorescence paniculate, axillary or terminal, usually 2 or 3 panicles forming an axillary fascicle, 6–15 cm long, peduncle and the floriferous axis pubescent to glabrous; primary bract (at inflorescence base) similar to stipules, caducous; secondary bracts (at pedicel base) ovate-lanceolate, 0.8–1.2 mm long, usually persistent; bracteoles (at pedicel apex) ovate, 0.5–0.7 mm long, persistent; pedicel 1–1.5 mm long, with a ring of red-brown glands clustered at axils of flower and bracteoles; buds obovoid. Flowers 5–6 mm long; hypanthium straight, 1–1.3 mm long; calyx pubescent, actinomorphic, sepals 5, tube 0.9–1.1 mm long, lobes 1.1–1.5 mm long; corolla actinomorphic, petals 5, white, short-clawed, sagittate-lanceolate, with carnose and inflexed auricles at base, pubescent or rarely glabrous, 4–4.3 × 1–1.5 mm; stamens 5, free, filaments 3.5–4.5 mm long, anthers 0.5–0.8 mm long, widely elliptic; ovary 1.5–3 mm long, ellipsoid, tomentose, 1 (rarely 2) ovulate, stipe 1–1.8 mm long, style 2–2.5 mm long, stigma small, punctiform. Fruits indehiscent, flattened, oblong, 1-seeded, 5–7.5 × 1.2–2.2 cm, coriaceous, reticulate, brown, glabrous, with sutural wing 2–2.3 mm wide, stipe 3–4 mm long. Mature seeds not seen, immature oblong, slightly oblique to fruit length.

Etymology. The generic name combines the name of the country where it is mostly found, Guyana, with the Greek word for tree, dendron.

Local names and uses. Guyana: blackheart. The wood is used for house posts and furniture (Sandwith, 1947).

Distribution and habitat. Occurring in central and north central Guyana, the new taxon is reported for the first time from Brazil, from the state of Amazonas. *Guianodendron praeclarum* occurs in Guyana in different forest types (wallaba forest, *Mora* forest, mixed lowland forests, and marsh forest), which range from high-canopied forests (canopy at 30–45 m) to lower-canopied forests (canopy at 10–17 m), usually on sandy, alluvial, loamy, and periodically inundated or well-drained soils (Hueck, 1972; Polak, 1992). In Brazil, it was found only in the caatingas amazônicas from upper Rio Negro, on sandy and wet soils, in the base of the Guiana Shield.

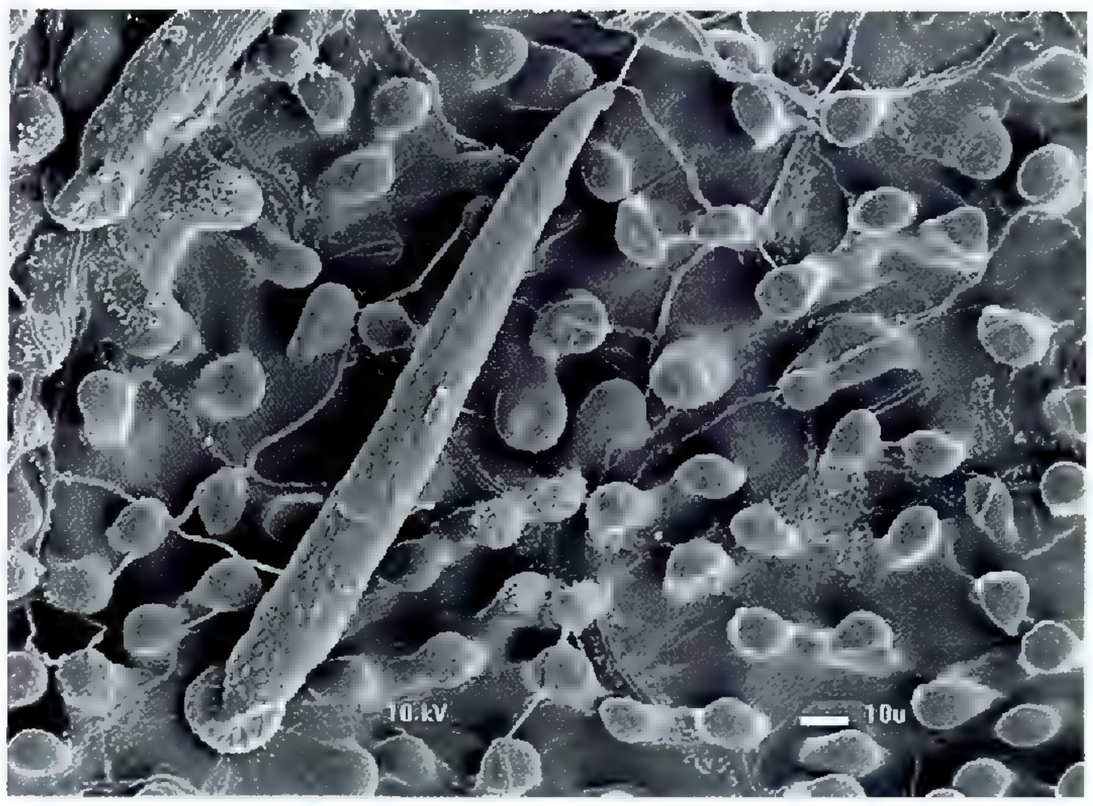

Figure 2. SEM image of abaxial surface of leaflets of *Guianodendron praeclarum* (Sandwith) Schütz Rodrigues & A. M. G. Azevedo, showing a papillate epidermis (*N. T. Silva & U. Brazão 60916*). Scale bar = 10 µm.

Phenology. Flowering specimens of *Guianodendron praeclarum* have been collected from January to September, and fruiting specimens from September to November.

Relationships. Recent phylogenetic analyses (Pennington et al., 2000, 2001; Crisp et al., 2000; Wojciechowski et al., 2004) have shown that the genistoid clade of Papilionoideae includes several Neotropical genera of Sophoreae, such as *Acosmium*, *Bowdichia* Kunth, *Clathrotropis* Harms, and *Diplotropis* Bentham, and probably the pantropical genus *Ormosia* Jackson, which may be among its most basally branching lineages (Wojciechowski, 2003). *Guianodendron praeclarum* shares some reproductive and vegetative features with *Diplotropis*, which is a South American genus comprising 12 species (Lima, 1985). *Diplotropis* species and *Guianodendron praeclarum* present persistent bracts and bracteoles, an auriculate standard petal, and samaroid fruits distinctly winged on the margin. Moreover, they have cryptohypogeal seedlings without cataphylls (Polhill, 1981; Polak, 1992). In addition, *Guianodendron praeclarum* and the two species of *Diplotropis* sect. *Racemosae* H. C. Lima have leaflets with a papillate abaxial epidermis (Metcalfe & Chalk, 1957; Herendeen & Dilcher, 1990) (Fig. 2). However, *Guianodendron prae-*

clarum does not fit within the limits of *Diplotropis* because of its radial flowers with 5 subequal auriculate petals, 5 stamens without staminodes, smaller flowers, a straight hypanthium, and reduced number of ovules (1, rarely 2). By contrast, *Diplotropis* has zygomorphic flowers, in which only the standard petal is auriculate, 10 stamens (*Diplotropis* sect. *Diplotropis*) or 5 stamens with 5 staminodes (*Diplotropis* sect. *Racemosae*), larger flowers, curved hypanthium, and 3 to 6 ovules (Lima, 1985; Lima & Aymard, 1999). A more detailed phylogenetic analysis of the basal elements of the genistoid clade, using molecular as well morphological characters, would appear to be in order.

Additional material examined. BRAZIL. **Amazonas:** Serra Pirapucu, rio Negro, Cauaburi, Maturacá, *N. T. Silva & U. Brazão 60916* (MG, NY). GUYANA. **Cuyini-Mazaruni:** Bartica-Potaro road, near 14th milepost, *N. Y. Sandwith 1109* (NY, U); E bank of Mazaruni river, opposite Kuminang village, betw. Kukui & Kako rivers, *S. S. & C. L. Tillett 15433* (NY). **Upper Demerara-Berbice:** Mabura, Waraputa compart., ca. 25 km S of Mabura, M. Polak, *H. Rijpkema & S. Roberts 505* (NY, U). **Uncertain location:** Keriti Creek, Essequibo River, *D. B. Fanshawe in Forest Dept. 3631* (U); Makauria Creek, *D. B. Fanshawe in Forest Dept. 3286* (F, NY, U); Moraballi Creek, Essequibo River, *D. B. Fanshawe in Forest Dept. 4033* (NY, U); mouth of Suru-a-gu-puh river, *S. S. & C. L. Tillett 15388* (NY); R.B. Blue creek, R.B. Groete creek, L.B. Essequibo River, *C. A. Persaud 331* (U).

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Literature Cited

Crisp, M. D., S. Gilmore & B. E. van Wyk. 2000. Molecular phylogeny of the genistoid tribes of papilionoid legumes. Pp. 249–276 *in* P. S. Herendeen & A. Bruneau (editors), Advances in Legume Systematics, Part 9. Royal Botanic Gardens, Kew.

Herendeen, P. S. & D. L. Dilcher. 1990. *Diplotropis* (Leguminosae, Papilionoideae) from the Middle Eocene of southeastern North America. Syst. Bot. 15: 526–533.

Hueck, K. 1972. As florestas da América do Sul. Polígono, São Paulo.

Lewis, G. P., B. Schrire, B. Mackinder & J. Lock (editors). 2005. Legumes of the World. Royal Botanic Gardens, Kew.

Lima, H. C. 1985. *Diplotropis* Benth. (Leguminosae-Faboideae)—estudo dos táxons infragenéricos. Acta Amazon 15: 61–75.

——— & G. A. Aymard. 1999. *Diplotropis* (Fabaceae). Pp. 315–318 *in* J. Steyermark, P. Berry, B. Holst & K. Yatskievych (editors), Flora of the Venezuelan Guayana, Vol. 5. Missouri Botanical Garden Press, St. Louis.

Metcalfe, C. R. & L. Chalk. 1957. Anatomy of the Dicotyledons, Vol. 2. Clarendon Press, Oxford.

Pennington, R. T., B. B. Klitgaard, H. Ireland & M. Lavin. 2000. New insights into floral evolution of basal Papilionoideae from molecular phylogenies. Pp. 233–248 *in* P. S. Herendeen & A. Bruneau (editors), Advances in Legume Systematics, Part 9. Royal Botanic Gardens, Kew.

———, M. Lavin, H. Ireland, B. Klitgaard, J. Preston & J.-M. Hu. 2001. Phylogenetic relationships of basal papilionoid legumes based upon sequences of the chloroplast *trn*L intron. Syst. Bot. 26: 537–556.

Polak, A. M. 1992. Major timber trees of Guyana—A field guide. The Tropenbos Foundation, Wageningen.

Polhill, R. M. 1981. Sophoreae. Pp. 213–230 *in* R. M. Polhill & P. H. Raven (editors), Advances in Legume Systematics, Part 1. Royal Botanic Gardens, Kew.

Sandwith, N. Y. 1947. Two new leguminous trees of British Guiana. Contr. Gray Herb. 165: 25–29.

Wojciechowski, M. F. 2003. Reconstructing the phylogeny of legumes (Leguminosae): An early 21st century perspective. Pp. 5–35 *in* B. B. Klitgaard & A. Bruneau (editors), Advances in Legume Systematics, Part 10. Royal Botanic Gardens, Kew.

———, M. Lavin & M. J. Sanderson. 2004. A phylogeny of legumes (Leguminosae) based on analysis of the plastid *mat*k gene resolves many well-supported subclades within the family. Amer. J. Bot. 91: 1846–1862.

Yakovlev, G. P. 1969. A review of *Sweetia* and *Icosmium*. Notes Roy. Bot. Gard. Edinburgh 29: 347–355.

Magnolia amabilis, a New Species of Magnoliaceae from Yunnan, China

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Abstract. A new species of Magnoliaceae, *Magnolia amabilis* Y. K. Sima & Y. H. Wang, from Yunnan, China, is described and illustrated. The new species resembles *Magnolia dianica* Y. K. Sima & Figlar in the stipules adnate to the petiole and the petioles short, not exceeding 10 mm, and in the tepals 6 to more, 3- to 4-merous, subsimilar; it differs in its leaves oblanceolate to narrowly elliptic, glaucous beneath, with nerves in 13 to 17 pairs, in its tepals contracted-acute at the apex, and in its mature carpels, glabrous, dark green, tawny-black when dry.

Key words: China, *Magnolia*, *Magnolia amabilis*, Magnoliaceae, Yunnan.

During an inventory of the state priority protection program for wild plants in Yunnan Province, Sima Yong-Kang observed a shrub species of *Magnolia* L., known as "Dujuan" (azalea) and introduced from Gejiu County in southeastern Yunnan by Liu Ke-Sheng to the Kunming Jindian Botanic Gardens in November 2000. In spring 2001, Mr. Sima visited the gardens again and acquired the type collection of the shrub in flower, *Y. K. Sima & B. Fang 98257*. Another collection was later made for the fruit, *Y. K. Sima & J. H. Li 98304*. It was affirmed that the shrub was a new species of *Magnolia* in Magnoliaceae.

In accordance with studies of the genus *Magnolia* L. (Figlar, 2000; Sima, 2001; Figlar & Nooteboom, 2004), we assign the new species to the genus *Magnolia* L. subg. *Yulania* Spach sect. *Michelia* (L.) Baillon subsect. *Michelia* (L.) Figlar & Nooteboom. Its discovery supports the viewpoint that southeastern Asia, especially southeastern Yunnan, is a center of biodiversity for Magnoliaceae (Law, 1984; Liu et al., 1995; Chen & Zhang, 1996; Liu, 2000; Sima, 2001; Sima et al., 2001; Zhang, 2001).

The flowers of the species are as showy as those of local species (e.g., *Rhododendron simsii* Planchon). Called "Dujuan" locally, the new species will be a worthy addition to world horticulture as an ornamental for further plant breeding.

Magnolia amabilis Y. K. Sima & Y. H. Wang, sp. nov. TYPE: China. Yunnan: Kunming, Jindian Botanic Gardens, in cult. (introduced from Gejiu County, SE Yunnan), 8 Mar. 2001 (fl), *Y. K. Sima & B. Fang 98257* (holotype, YCP). Figure 1.

Species *Magnoliae dianicae* Y. K. Sima & Figlar similis, sed foliis oblanceolatis vel anguste ellipticis, subtus glaucis; nervis lateralibus 13 ad 17; tepalis apice breviter acutis; folliculis glabris, atro-viridibus, in sicco furvis differt.

Shrub, 1–4 m high; buds, young twigs, stipules outside, petiole and peduncles densely pubescent with short tawny, brown, or rufous indument; twigs green when young, gray and glabrous when old. Young leaves in buds erect, conduplicate; leaves coriaceous, oblanceolate to narrowly elliptic, 5–9 × 1–2 cm, acuminate at apex, cuneate at base, glabrous, dark green above, pale green, glaucous, sparsely tawny pubescent to glabrescent beneath; midrib slightly impressed above, nerves much visible on both surfaces when dry, in 13 to 17 pairs; reticulation sparsely netted, prominent on both surfaces when dry; petioles 4–6 mm long, stipular scars 2–3 mm long. Peduncle 5–8 mm long, ca. 2 mm diam., with 2 or 3 internodes, pedicel absent or less than 1 mm long. Flower heavily scented; tepals 6 to 8, white or

Figure 1. *Magnolia amabilis* Y. K. Sima & Y. H. Wang, sp. nov. —A. Flowering branch. —B. Adaxial view of petiole, showing stipular scar. —C. Inner tepal. —D. Outer tepal. —E. Gynoecium. —F. Stamen. Drawn by Liu Ling from the holotype (*Y. K. Sima & B. Fang 98257*, YCP).

yellowish white, narrowly to broadly obovate, 1.5–3.0 × 0.5–2.0 cm, contracted-acute at the apex; stamens 55 to 64, persistent, 0.9–1.2 cm long, connective appendage triangular, anthers 0.6–0.8 cm long; gynoecium cylindrical, 1.0–1.2 cm long; gynophore 5–7 mm long, densely appressed pubescent with short tawny trichomes; carpels 10 to 19, ovoid, 1–2 mm long; styles ca. 2 mm long; ovules 2 to 6. Fruit 2.7–6.9 cm long; mature carpels 1 to 10, globose or ovoid to ellipsoid, 8–16 mm long, 7–11 mm diam., glabrous, dark green, tawny-black when dry, sparsely but conspicuously lenticellate, dehiscent along two valves ventrally.

Habitat and distribution. In subtropical forest or thickets, 1700–2100 m; known only from southeastern Yunnan, China.

Phenology. Flowering from February to April; fruiting from July to August.

Although *Magnolia amabilis* is similar to *Magnolia dianica* Y. K. Sima & Figlar in the stipules adnate to the petiole and the petioles short, not exceeding 10 mm, and in the tepals 6 to more, 3- to 4-merous, subsimilar, the latter differs mainly in its obovate, narrowly obovate, or narrowly obovate-elliptic leaves, not glaucous beneath, with nerves in 7 to 11 pairs, in its emarginate tepals, and in its mature carpels, yellowish green or dark red, rufous when dry, with short indument.

Paratypes. CHINA. **Yunnan:** Kunming, Jindian Botanic Gardens, in cult. (introduced from Gejiu County, SE Yunnan), *Y. K. Sima 98250* (MO, PE, YCP), *Y. K. Sima & J. H. Li 98304* (PE, YCP), *Y. K. Sima & Z. J. Yang 98505* (PE, YCP), *Y. K. Sima 98591* (KUN, MO, PE, YCP).

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Literature Cited

Chen, T. & H. D. Zhang. 1996. A phytogeographical analysis of Magnoliaceae. J. Wuhan Bot. Res. 14(2): 141–146.

Figlar, R. B. 2000. Proleptic branch initiation in *Michelia* and *Magnolia* subgenus *Yulania* provides basis for combinations in subfamily Magnolioideae. Pp. 14–25 *in* Y. H. Liu, H. M. Fan, Z. Y. Chen, Q. C. Wu & Q. W. Zeng (editors), Proceedings of the International Symposium on the Family Magnoliaceae. Science Press, Beijing.

——— & H. P. Nooteboom. 2004. Notes on Magnoliaceae IV. Blumea 49: 87–100.

Law, Y. W. 1984. A preliminary study on the taxonomy of the family Magnoliaceae. Acta Phytotax. Sin. 22(2): 89–109.

Liu, Y. H. 2000. Studies on the phylogeny of Magnoliaceae. Pp. 3–13 *in* Y. H. Liu, H. M. Fan, Z. Y. Chen, Q. C. Wu & Q. W. Zeng (editors), Proceedings of the International Symposium on the Family Magnoliaceae. Science Press, Beijing.

———, N. H. Xia & H. Q. Yang. 1995. The origin, evolution and phytogeography of Magnoliaceae. J. Trop. Subtrop. Bot. 3(4): 1–12.

Sima, Y. K. 2001. Some notes on *Magnolia* subgenus *Michelia* from China. Yunnan Forest. Sci. Technol. 2001(2): 29–3540.

———, J. Wang, L. M. Cao, B. Y. Wang & Y. H. Wang. 2001. Prefoliation features of the Magnoliaceae and their systematic significance. J. Yunnan Univ. 23(Suppl.): 71–78.

Zhang, B. 2001. Floral analysis of Magnoliaceae. Guihaia 21(4): 315–320.

A New Name and Three New Combinations in Brazilian Myrtaceae

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Abstract. Four nomenclatural arrangements are proposed in Brazilian Myrtaceae: in *Myrcia*, one new name (*M. neorostrata* for *Aulomyrcia rostrata*) and two new combinations (*M. densa* for *Calyptranthes densa* and *M. tenuifolia* for *Aulomyrcia tenuifolia*), and one new combination in *Myrciaria*, *M. glazioviana*, based on *Eugenia cabelludo* var. *glazioviana*.

Resumo. São propostas quatro alterações nomenclaturais em Myrtaceae brasileiras: um novo nome em *Myrcia* (*M. neorostrata* em substituição a *Aulomyrcia rostrata*), duas novas combinações em *Myrcia* (*M. densa*, baseada em *Calyptranthes densa* e *M. tenuifolia*, em *Aulomyrcia tenuifolia*), e uma nova combinação em *Myrciaria*, *M. glazioviana*, baseada em *Eugenia cabelludo* var. *glazioviana*.

Key words: Brazil, *Myrcia*, *Myrciaria*, Myrtaceae.

The family Myrtaceae is represented by approximately 1000 species in Brazil (Landrum & Kawasaki, 1997); many of these species have not been reviewed since the monograph by O. Berg (1857–1859), and several have not been re-collected since then. However, extensive recent collections and floristic surveys in Brazil have yielded interesting rediscoveries of many of these nearly forgotten species, some of which need new names or combinations in the light of contemporary generic concepts in Myrtaceae (McVaugh, 1968; Landrum & Kawasaki, 1997). This paper represents nomenclatural changes for four species from southeastern and central Brazil.

Myrcia DC. ex Guillaumin

The genus *Aulomyrcia* O. Berg (Berg, 1855–1856) was erected to accommodate those species of *Myrcia* bearing a calyx tube. In the *Flora Brasiliensis* (Berg, 1857–1859), 213 species were assigned to *Aulomyrcia* and 137 to *Myrcia*, based on the presence or absence of an evident calyx tube, mostly 1–2 mm deep. *Aulomyrcia* was merged in *Myrcia* in most subsequent studies of the Myrtaceae (e.g., Grisebach, 1864; Kiaerskou, 1893; Niedenzu, 1893; Rodrigues, 1907; Legrand, 1936; McVaugh, 1968; Landrum & Kawasaki, 1997), with only limited recognition (Amshoff, 1951; Kausel, 1966). Although such merging resulted in new names and combinations in *Myrcia*, at least three species were never transferred, and the present paper proposes names for them in *Myrcia*.

1. **Myrcia densa** (DC.) Sobral, comb. nov. Basionym: *Calyptranthes densa* DC., Prodr. 3: 257. 1828. *Aulomyrcia densa* (DC.) O. Berg, Fl. Bras. 14 (1): 69. 1857. TYPE: Brazil. Minas Gerais, *Martius 144* (M).

Myrcia densa is a shrub 2–3 m tall from campos rupestres and caatingas. Originally collected in Minas Gerais (Candolle, 1828), the taxon was also found recently in northern Bahia at the municipalities of Filadélfia (*Giulietti & Harley 1876*, BHCB, HUEFS) and Saúde (*França 2958*, BHCB, HUEFS). No collection number is cited in the protologue by de Candolle (1828), but the Munich specimen corresponds well and is annotated by de Candolle (as *Calyptranthes densa*) and subsequently by Berg (as *Aulomyrcia densa*).

2. **Myrcia neorostrata** Sobral, nom. nov. Replaced name: *Aulomyrcia rostrata* O. Berg, Fl. Bras. 14(1): 544. 1859 (suppl.), non *Myrcia rostrata* DC., Prodr. 3: 255. 1828. TYPE: Brazil. Bahia, *Blanchet 1880* (holotype, LE, photo seen.)

This species apparently was known until now only from the type specimen, collected in Bahia (Berg, 1857–1859). The second specimen known to me was collected recently in the montane coastal forests of Santa Teresa, in the state of Espírito Santo (mun. Santa Teresa; *Verdoet 1331*, BHCB, MBML).

3. **Myrcia tenuifolia** (O. Berg) Sobral, comb. nov. Basionym: *Aulomyrcia tenuifolia* O. Berg, Fl. Bras. 14(1): 67. 1857. TYPE: Brazil. Bahia, *Blanchet 2321* (holotype, HAL not seen; isotype, NY).

Myrcia tenuifolia is a treelet to 4 m tall, growing in cerrados. Originally collected in Bahia (Berg, 1857–1859), it was recently found in the state of Minas Gerais (mun. Joaquim Felício; *Hatschbach 64404*, BHCB, MBM).

Myrciaria O. Berg

1. Myrciaria glazioviana (Kiaerskou) G. Barroso ex Sobral, comb. nov. Basionym: *Eugenia cabelludo* Kiaerskou var. *glazioviana* Kiaerskou, Enum. Myrt. Bras. 180. 1893. *Paramyrciaria glazioviana* (Kiaerskou) Sobral, Candollea 46: 515. 1991. TYPE: Brazil. Rio de Janeiro, *Schenck 3751* (lectotype, designated by Sobral, 1991, C).

Eugenia cabelludo was proposed by Kiaerskou (1893) as a new name for *Myrciaria glomerata* O. Berg (non *Eugenia glomerata* Spring ex Martius). In the same paper, he proposed a new variety, *E. cabelludo* var. *glazioviana*, which he distinguished from the typical variety by "wider leaves and more softly hairy flowers" (Kiaerskou, 1893: 180).

Myrciaria glazioviana is a shrub or treelet to 3 m high, native probably from Rio de Janeiro and Minas Gerais, but frequently cultivated from Bahia to Rio Grande do Sul in Brazil for its edible fruits. Its vernacular name is "cabeluda" ("hairy" in Portuguese; hence the origin of Kiaerskou's epithet). Recently, it has been considered a synonym of *Plinia glomerata* (O. Berg) Amshoff (e.g., Legrand & Klein, 1978; Mattos, 1984), a distinct species more properly referred to *Myrciaria* O. Berg due to its deciduous calyx tube, which keeps it apart from *Plinia*. The two species can be distinguished by the characters in the following key:

Key for Distinguishing *Myrciaria glomerata* and *Myrciaria glazioviana* in Eastern Brazil

1a. Flowers with bracteoles to 2 mm, much smaller than the flower buds; leaf blades with a cuneate or obtuse base and scarcely or not at all revolute margins; Minas Gerais and Pará . . . . . *M. glomerata*

1b. Flowers with bracteoles to 5 mm, as long as the flower buds; leaf blades with a cordate base and clearly revolute margins; widely cultivated from Bahia to Rio Grande do Sul . . . . . *M. glazioviana*

Myrciaria glazioviana was erroneously assigned to *Paramyrciaria* (Sobral, 1991), a genus established by Kausel (1966) to accommodate *M. delicatula* (DC.) O. Berg, with embryos bearing plano-convex cotyledons instead of the fused ones supposedly characteristic of *Myrciaria*. The Kauselian genus was prudently relegated to the synonymy of *Myrciaria* by several authors (e.g., McVaugh, 1968; Legrand & Klein, 1978; Mattos, 1984; Landrum & Kawasaki, 1997), although the taxon was accepted by Rotman (1982) and myself (Sobral, 1991). However, further examination of additional specimens of *Myrciaria* has revealed that cotyledons may vary from separate to fused even in the same plant (e.g., *Sobral 511* (ICN)). In an earlier paper (Sobral, 1991), new combinations were proposed in *Paramyrciaria* for six species placed in *Myrciaria*; all already have valid names in *Myrciaria*, except the one proposed here.

Graziela Barroso (pers. comm.) intended to publish the new combination presented here, having referred informally to this name in one of her papers (Barroso & Peron, 1994), without citing any specimens.

Acknowledgments. I am very grateful to Alexander Sennikov (LE) and Jacquelyn Kallunki (NY) for their kind help in sending me images or types of the studied species. As always, suggestions of Victoria Hollowell (MO) and two anonymous reviewers helped improve this paper. I would also like to express, although posthumously, my gratitude to Graziela Maciel Barroso (1912–2003), for her friendship and for sharing her opinions on the Myrtaceae with me throughout her life.

Literature Cited

Amshoff, G. J. H. 1951. Myrtaceae. *In:* A. Pulle (editor), Flora of Suriname 3: 56–158.

Barroso, G. M. & M. Peron. 1994. Myrtaceae. Pp. 261–302 *in* M. Lima & R. Guedes-Bruni (organizers), Reserva Ecológica de Macaé de Cima, Nova Friburgo, Rio de Janeiro, V. 1. Aspectos Florísticos das Espécies Vasculares. Rio de Janeiro, Jardim Botânico do Rio de Janeiro.

Berg, O. 1855–1856. Revisio Myrtacearum Americae. Linnaea 27: 1–472.

———. 1857–1859. Myrtaceae. *In:* C. F. P. von Martius (editor), Flora Brasiliensis 14(1): 1–656.

Candolle, A. P. de. 1828. Prodromus Systematis Universalis Regni Vegetabilis 3: 207–296.

Grisebach, A. 1864. Pp. 232–243 *in* Flora of the British West Indian Islands. Lovell Reeve, London.

Kausel, E. 1966. Lista de las mirtaceas y leptospermaceas argentinas. Lilloa 32: 323–388.

Kiaerskou, H. 1893. Enumeratio myrtacearum brasiliensium. *In:* E. Warming (editor), Symbolarum ad floram Brasiliae Centralis cognoscendam 39: 1–199.

Landrum, L. R. & M. L. Kawasaki. 1997. The genera of Myrtaceae in Brazil: An illustrated synoptic treatment and identification keys. Brittonia 49: 508–536.

Legrand, C. D. 1936. Las myrtaceas del Uruguay. Anales Mus. Hist. Nat. Montevideo 2a série 4(11): 1–71.

——— & R. M. Klein. 1978. Mirtáceas—*Myrciaria*, *Pseudocaryophyllus*, *Blepharocalyx*, espécies suplementares, espécies cultivadas, generalidades. Pp. 731–876 *in* R. Reitz (editor), Flora Ilustrada Catarinense. Itajaí, Brazil.

Mattos, J. R. 1984. Myrtaceae do Rio Grande do Sul. Roessléria 6: 3–394.

McVaugh, R. 1968. The genera of American Myrtaceae—An interim report. Taxon 17: 354–418.

Niedenzu, F. 1893. Myrtaceae. *In:* A. Engler (editor), Die natürlichen Pflanzenfamilien 3(7): 57–105.

Rodrigues, J. B. 1907. Myrtaceae. *In:* R. Chodat & E. Hassler (editors), Plantae Hasslerianae. Bull. Herb. Boissier 2 série 7: 795–808.

Rotman, A. 1982. Los géneros *Calycorectes*, *Hexachlamys*, *Myrciaria*, *Paramyrciaria*, *Plinia* y *Siphoneugena* en la flora argentina. Darwiniana 24: 157–185.

Sobral, M. 1991. Sinopsis de las especies reconocidas del género *Paramyrciaria* Kausel (Myrtaceae). *In:* R. Spichiger & G. Bocquet (editors), Notulae ad floram paraquaiensem. Candollea 46: 512–521.

Arnica lanceolata subsp. *prima*, the Correct Name for *Arnica lanceolata* Nuttall subsp. *amplexicaulis* (Nuttall) Gruezo (Asteraceae, Heliantheae)

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Abstract. The new combination *Arnica lanceolata* subsp. *prima* (Maguire) Strother & S. J. Wolf is proposed as the correct name for *Arnica lanceolata* subsp. *amplexicaulis* (Nuttall) Gruezo.

Key words: *Arnica*, Asteraceae, Heliantheae, nomenclature.

Under Art. 52.1 of the *International Code of Botanical Nomenclature* (Greuter et al., 2000), the name *Arnica lanceolata* Nuttall subsp. *amplexicaulis* (Nuttall) Gruezo (Gruezo & Denford, 1994) is illegitimate.

Arnica amplexifolia Rydberg was published as a substitute for *A. amplexicaulis* Nuttall because Rydberg (1900) took *A. amplexicaulis* Nuttall to be a later homonym of the *A. amplexicaulis* of Candolle (1838), a name published as a synonym under *Ligularia amplexicaulis* DC. Under Art. 34.1(c), the *A. amplexicaulis* of Candolle was not validly published. Although Rydberg's *A. amplexifolia* was illegitimate under Art. 52.1, Maguire (1942) accepted what Rydberg had done and published *A. amplexifolia* Rydberg subsp. *prima* Maguire. In 1943, Maguire concluded that Rydberg was mistaken and Maguire corrected himself by publishing *A. amplexicaulis* Nuttall subsp. *prima* (Maguire) Maguire.

Ordinarily, an autonym has priority over the name that caused establishment of that autonym (Art. 11.6). Under Art. 27.1, the autonym *A. amplexifolia* Rydberg subsp. *amplexifolia* was not created upon publication of *A. amplexifolia* subsp. *prima* because *A. amplexifolia* Rydberg is illegitimate. Under Art. 55.2, the epithet *prima* in *A. amplexifolia* Rydberg subsp. *prima* Maguire is legitimate. Maguire's *prima* of 1942 is the earliest legitimate and available epithet for a taxon at subspecies rank with the circumscription and position adopted here.

Arnica lanceolata Nuttall subsp. **prima** (Maguire) Strother & S. J. Wolf, comb. nov. Basionym: *Arnica amplexifolia* Rydberg subsp. *prima* Maguire, Madroño 6: 154. 1942. *Arnica amplexicaulis* Nuttall subsp. *prima* (Maguire) Maguire, Brittonia 4: 472. 1943. TYPE: U.S.A. Alaska: Kodiak, 28 Aug. 1867, *A. Kellogg 231* (holotype, PH; isotypes, GH, MO, NY, US).

Arnica amplexicaulis Nuttall, Trans. Amer. Philos. Soc., n. s. 7: 408. 1841. TYPE: U.S.A. Oregon: "On the rocks of the Wahlamet, at the Falls," [no date] *Nuttall s.n.* (holotype, BM; isotypes, GH, UC).

Arnica amplexicaulis Nuttall var. *piperi* H. St. John & F. A. Warren, Proc. Biol. Soc. Wash. 44: 36. 1931. TYPE: U.S.A. Washington: Cape Horn, 26 June 1904, *C. V. Piper 4692* (holotype, WS; isotypes, UC, US).

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Literature Cited

Candolle, A. P. de. 1838. *Ligularia*. *In*: Prodromus Systematis Naturalis Regni Vegetabilis 6: 313–316. Treuttel et Würtz, Paris.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. S. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Gruezo, W. S. & K. E. Denford. 1994. Taxonomy of *Arnica* L. subgenus *Chamissonis* Maguire (Asteraceae). Asia Life Sci. 3(2): 89–212.

Maguire, B. 1942. *Arnica* in Alaska and Yukon. Madroño 6: 153–155.

———. 1943. A monograph of the genus *Arnica*. Brittonia 4: 386–510.

Rydberg, P. A. 1900. Catalogue of the flora of Montana and the Yellowstone National Park. Mem. New York Bot. Gard. 1: vi–xii, 1–192.

Schumannianthus monophyllus (Marantaceae)—A New and Unusual Species from Borneo

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Abstract. *Schumannianthus monophyllus* Suksathan, Borchsenius & A. D. Poulsen, a new species of Marantaceae is described and illustrated. It differs from its closest relative *S. dichotomus* (Roxburgh) Gagnepain in having acaulescent vegetative shoots and shortly caulescent, unbranched fertile shoots (vs. with richly branched aerial stems), each shoot with only a single leaf, and in having a loosely capitate, branched inflorescence (vs. narrowly spiciform and usually unbranched in *S. dichotomus*).

Key words: Borneo, Malaysia, Marantaceae, Sarawak, *Schumannianthus monophyllus*.

The genus *Schumannianthus* Gagnepain (Gagnepain, 1904) is a small Asian genus of the Marantaceae, with two species: *S. dichotomus*, ranging from Myanmar through Thailand, Indo-China, and Peninsular Malaysia to Borneo; and *S. virgatus* (Roxburgh) Rolfe, distributed in Sri Lanka and southern India. Diagnostic characters of the genus include dolichoblastic flower pairs (i.e., with flowers borne on elongated axes), a short corolla tube, a conspicuous staminal tube, the presence of small glandular bracteoles (which function as nectaries and attract ants for the protection of the inflorescence), a single appendage of the cucullate staminode, and dehiscent fruits (Andersson, 1998). The genus is closely related to and often confused with the genus *Donax* Loureiro, which has a similar habit and overall appearance, but differs in having white, fleshy, drupaceous fruits and a short staminal tube (vs. long in *Schumannianthus*). In this paper we describe a new species of *Schumannianthus* recently collected by the third author in northern Sarawak.

Schumannianthus monophyllus Suksathan, Borchsenius & A. D. Poulsen, sp. nov. TYPE: Malaysia (Borneo). Sarawak: Niah Nat. Park, [3°49′N, 113°46′E], close to main board walk to Niah cave, lowland forest, not flooded, 15 m, 26 Nov. 2002, *A. D. Poulsen & Muhidin bin Masalleh 1943* (holotype, SAR; isotypes, AAU, L, MO, QBG, Sarawak Biodiversity Center). Figure 1.

Species nova, *Schumanniantho dichotomo* affinis a qua differt habitu rosulato ad 1 m alto, surculis unifoliatis, synflorescentia breviter capitata ut videtur laterali e petiolo folii concomitati, floribus ad 1.1 cm longis, fructibus verrucosis.

Rhizomatous ground herb, 0.5–1 m tall; each shoot with a single leaf plus 1 to 2(to 3) basal, bladeless sheaths, 5.5–22.5 cm long, these glabrous, purple when young, becoming dry and light brown with age; vegetative shoots acaulescent; fertile shoots with an erect, unbranched stem, 27–35 cm long. Leaf glabrous, green; on vegetative shoot with petiole 29.5–60 cm long, on fertile shoot epetiolate, inserted near the tip of the stem just below the inflorescence; pulvinus 0.6–1.5 cm long; lamina falcate, rarely subelliptic, apex acute to acuminate, 22–31 × 5.6–9.8 cm, green above, pale below. Inflorescence composed of 4 to 6 branches forming a loosely capitate cluster 2–5 cm long; each branch with 2 to 4 bracts of which the 2 terminal subtend a special paraclade with (2 to)3 to 4 flower pairs, the branch itself subtended by a light brown, lanceolate, acute, papery bract, which is curled and forms a tube 1.2–1.5 cm long; flower pairs markedly dolichoblastic, each associated with a prophyll 4–12 mm long and ca. 1 mm wide; interphylls absent; length of flower pair axes from the base to the first flower (0.5–)1–2 cm long, and from the first flower to the second flower (2–)4–5 mm long, the lower flower of each pair associated with a persistent, fleshy, glandular bracteole, ca. 1 mm long. Flower entirely white, ca. 1.1 cm long; sepals free, lanceolate to triangular, acute, 1.6–2.1 × 1 mm; petals partly fused with the ca. 3.7 mm

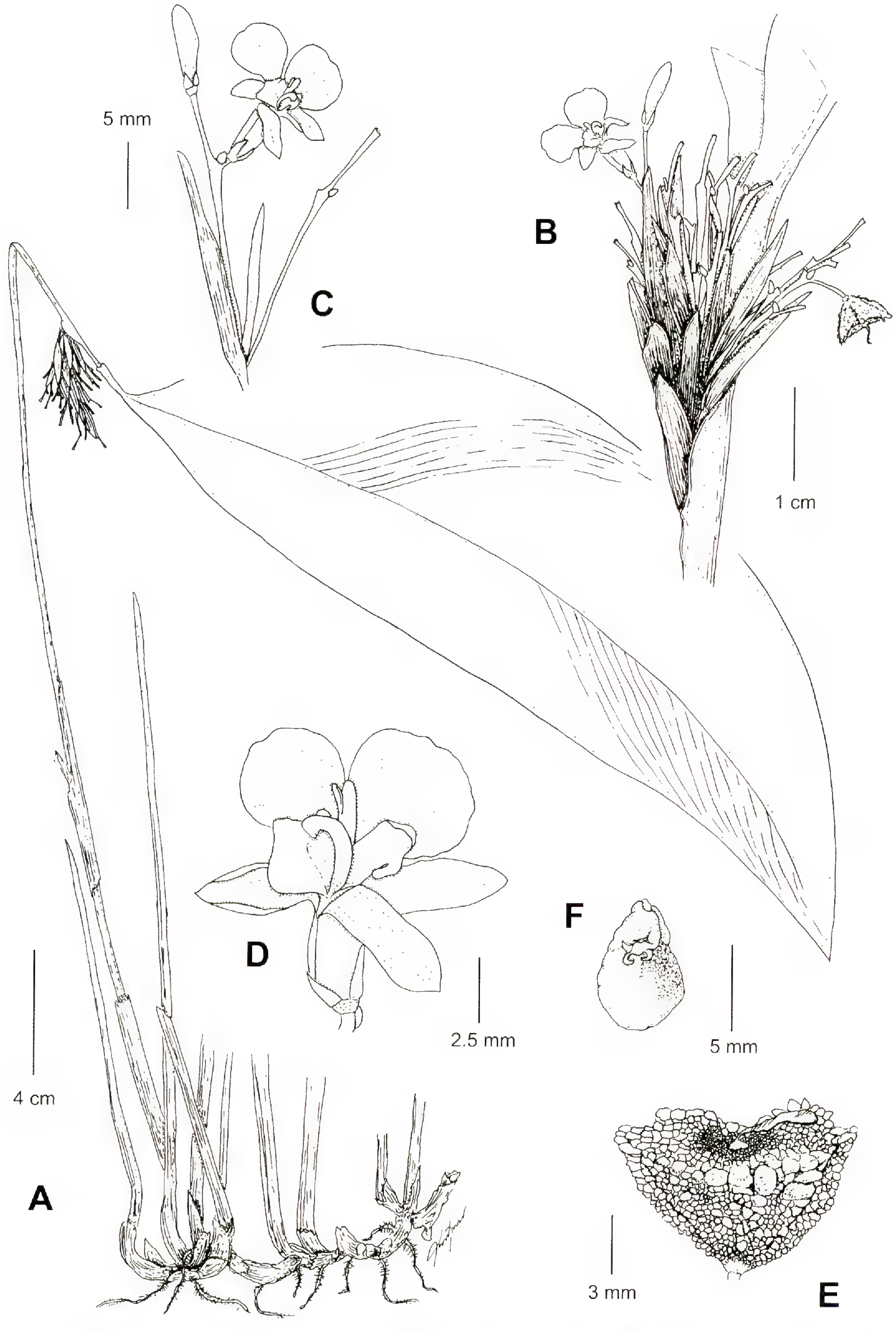

Figure 1. *Schumannianthus monophyllus* Suksathan, Borchsenius & A. D. Poulsen. —A. Habit. —B. Inflorescence. —C. Special paraclade with bract. —D. Flower. —E. Fruit. —F. Seed. Drawn by P. Suksathan from the isotype, *A. D. Poulsen & Muhidin bin Masalleh 1913* (AAU).

long staminal tube, corolla lobes oblong, acute, ca. 5 × 2 mm; outer staminodes 2, broadly obovate, slightly unequal, 5 × 4–5 mm; cucullate staminode oblong, ca. 3 × 1.3 mm, with a simple, ca. 1.2 mm long appendage; callose staminode obovate to obtrullate, ca. 3.3 mm long; fertile stamen ca. 5.5 mm long, with narrowly oblong appendage of ca. 2.5 × 0.5 mm; style curved, with free part of ca. 3 mm, stigmatic cavity ca. 0.4 mm diam.; ovary ca. 0.5 mm diam., verrucose. Immature fruit obpyramidal, light green, warty with thorny edges, 1 × 1.4 × 0.9 cm; seeds 2, globose, ca. 5 mm diam.; aril large, conical, ca. 4 mm long, with 4 to 6 short, thick, wrinkled appendages.

Distribution and ecology. Lowland evergreen forest of northwestern Borneo. Currently, known only from the Malaysian state of Sarawak.

Vernacular name. Daun rirak (Iban language; collectors notes to type collection).

Uses. Leaves are used for wrapping glutinous rice at Gawai Festival (Iban).

Schumannianthus monophyllus is unusual compared to other species of the genus in its habit, with acaulescent vegetative shoots and short-stemmed, unbranched flowering shoots. In *S. dichotomous*, all shoots have an elaborate, richly branched aerial stem system reaching several meters in height. A similar habit is also found in *Donax canniformis* (G. Forster) K. Schumann, the closest relative of *Schumannianthus* (Andersson, 1998). The occurrence of only a single leaf per shoot is also unusual and distinguishes *S. monophyllus* vegetatively from all other Asian Marantaceae species so far described.

The new species is placed in the genus *Schumannianthus* due to its combination of glandular bracteoles, dolichoblastic flower pairs, absence of interphylls, and, particularly, dehiscent, triangular fruits, a combination not found in any other genus of Marantaceae. Several features of this new species, however, suggest that generic limits within the *Schumannianthus–Donax* complex may be in need of reconsideration. *Schumannianthus dichotomus* has flowers with a short corolla tube and a much longer staminal tube, whereas in *D. canniformis* the corolla tube is relatively long and the staminal tube short (Andersson, 1998). The flowers of *S. monophyllus*, with their short staminal tube, thus resemble those of *D. canniformis* rather than those of *S. dichotomus*. Furthermore, the new taxon has only one glandular bracteole per flower pair, associated with the lower flower, whereas in *S. dichotomus* and *D. canniformis* both flowers have bracteoles. Ongoing phylogenetic studies based on molecular data (Suksathan et al., unpublished) have so far not been able to provide unambiguous resolution of the relationships among the three taxa. We therefore prefer to maintain the current generic delimitation intact until a robust phylogenetic hypothesis for the group has been established.

Schumannianthus monophyllus is one of seven new Marantaceae species described from Borneo during the past three years (Clausager & Borchsenius, 2003; Suksathan & Borchsenius, 2003; Poulsen & Clausager, 2004), suggesting that the number of Marantaceae species that occur in Borneo and in the Malesian region as such may be underestimated. Additional fieldwork in Borneo is likely to reveal further new discoveries.

Paratypes. MALAYSIA [Borneo]. **Sarawak:** Niah, Gunung Subis area, *Mohidin S.21637* (K, L, SAR); Niah Nat. Park, Pengkalan Lobang to Niah Caves, *B. L. Burtt & P. J. B. Woods B. 2000* (E, SAR); Simalajau Nat. Park, Sungai Kebalak, *Abg. Mohtar & H. Othman S. 59579* (K, KEP, L, SAR); Tatau, Bukit Buan, *J. W. Purseglove P. 5473* (NY); Tatau, Sungai Gemuan, *H. Othman & Munting S.54338* (SAR); Tubau, Sungai Tubau, above Tubau village, *P. S. Ashton 18390* (K, SAR).

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Literature Cited

Andersson, L. 1998. Marantaceae. Pp. 278–293 *in* K. Kubitzki (editor), The Families and Genera of Vascular Plants IV. Springer Verlag, Berlin.

Clausager, K. & F. Borchsenius. 2003. Marantaceae of Sabah. Kew Bull 58: 647–678.

Gagnepain, F. 1904. Zingibéracées et Marantacées nouvelles. Bull. Soc. Bot. France 51: 179.

Poulsen, A. D. & K. Clausager. 2004. A new species of *Stachyphrynium* (Marantaceae) from Borneo. Gard. Bull. Singapore 56: 161–166.

Suksathan, P. & F. Borchsenius. 2003. Two new species of *Stachyphrynium* (Marantaceae) from SE Asia. Willdenowia 33: 403–408.

Rubiacearum Americanarum Magna Hama Pars XVIII: New Species of *Psychotria* Subg. *Psychotria* from Central America and Western South America

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Abstract. Nine new Neotropical species of *Psychotria* subg. *Psychotria* (Rubiaceae, Psychotrieae) are described and illustrated here: *P. areolata* of montane western Colombia has previously been confused with *P. rugulosa* Kunth; *P. ceronii* of eastern Andean slopes in Ecuador and Peru has previously been confused with *P. acreana* K. Krause; *P. convergens* of montane Costa Rica, Panama, Colombia, Ecuador, and northern Peru has previously been confused with *P. sylvivaga* Standley; *P. cutucuana* of montane Ecuador has previously been confused with *Notopleura*; *P. esmeraldana* of coastal Ecuador and Colombia has previously been confused with *P. orosiana* Standley; *P. montivaga* of montane Colombia, Ecuador, and Peru has previously been confused with *P. alba* Ruiz & Pavón and *P. carthagenensis* Jacquin, and replaces these species at higher elevations; *P. parvillosa* of Amazonian Ecuador and Peru has previously been confused with *P. villosa* Ruiz & Pavón; *P. puyoana* of eastern Andean slopes of Ecuador is notable for its subsessile, cordate, relatively large leaves; and *P. ucumariana* of montane Colombia and Ecuador has previously been confused with *P. rimbachii* Standley.

Key words: Colombia, Costa Rica, Ecuador, *Notopleura*, Panama, Peru, *Psychotria*, Psychotrieae, Rubiaceae.

Psychotria L. (Rubiaceae, Psychotrieae) in its broad sense comprises very approximately 1650 (Hamilton, 1989) species, mostly shrubs and small trees, found throughout the world's tropics. This genus is characterized by its usually woody habit; its relatively small, entomophilous, usually white or cream-colored flowers that are typically distylous; its valvate corolla lobe aestivation; its inferior ovary with usually two locules, each with one basal ovule; and its drupaceous fruits with usually two plano-convex pyrenes (Hamilton, 1989). Systematic studies using both morphological and molecular characters have indicated that Neotropical *Psychotria* as it is currently circumscribed is systematically complex (Taylor, 1996, 2002; Nepokroeff et al., 1999; Andersson & Rova, 1999; Piesschaert, 2001; Andersson, 2002), but all of these studies have considered *Psychotria* subg. *Psychotria* a generally monophyletic group.

Neotropical *Psychotria* subg. *Psychotria* is characterized by the distinctive color of its dried specimens, which usually are strongly tinged with brown, reddish brown, reddish gray, gray, or grayish green; its stipules of widely varied form but that are usually quickly caducous to expose a ring of well-developed infrastipular colleters (i.e., glandular trichomes), which are up to 3 mm long and typically persistent on the stem as a chestnut-brown fringe; its white flowers that are usually relatively short, with tubes 1–8 mm long, and pubescent in the throat and/or at the point of stamen insertion; and its orange to red fruits that bear two plano-convex, usually longitudinally ridged pyrenes. The pyrenes are characterized by an alcohol-soluble reddish pigment and a lack of preformed germination slits, and both of these characters are shared with paleotropical species of *Psychotria* subg. *Psychotria* (Petit, 1964; Nepokroeff et al., 1999; Piesschaert, 2001). In contrast, the Neotropical group *Psychotria* subg. *Heteropsychotria* Steyermark has dried specimens with a usually green or brownish green color; stipules of various forms but usually persistent and without colleters or with the colleters caducous or drying clear; fruits that are white, blue, or purple at maturity; and pyrenes two to five per fruit and widely varied in form but lacking alcohol-soluble red pigments and bearing preformed germination slits. Another pantropical group of ca. 50 species, the Neotropical members of which were previously included in *Psychotria*, is distinguished by its combination of green drying color, stipules with the basal portion persistent or tardily falling by fragmentation, and red to orange fruits; this group has recently been separated from *Psychotria* by Andersson (2001) and moved to the expanded genus *Margaritopsis* Grisebach.

The species described below were discovered during preparation of treatments for the *Flora Mesoamericana* and the *Flora of Ecuador*.

Psychotria areolata C. M. Taylor, sp. nov. TYPE: Colombia. Valle del Cauca: mpio. Cali, correg. Elvira, Cordillera Oriental, Finca Zingara, km 18 de la carretera Cali–Buenaventura, km 4 vía a Dapa, 3°30′N, 76°34′W, 1900 m, 23 Apr. 1994, *J. Giraldo-Gensini 285* (holotype, CUVC; isotype, MO-4947507). Figure 1E–H.

Haec species a congeneris colombianis foliorum venis secundariis tertiariisque abaxialiter prominentibus adaxialiter sulcatis areolas irregulares formantibus atque floribus in glomerulos densos dispositis distinguitur.

Shrub or small tree to 5 m tall; stems densely short-tomentellous to glabrescent. *Leaves* elliptic to oblanceolate, 13–22 × 3–8 cm, at apex acute to acuminate, at base cuneate, drying membranaceous to papyraceous, adaxially glabrous, abaxially hirtellous to glabrescent on lamina and hirtellous to tomentellous or puberulous on veins; secondary veins 13 to 17 pairs, looping to interconnect with submarginal vein moderately to well developed and often nearly straight, without domatia, adaxially with costa, secondary veins, and tertiary veins shallowly sulcate, abaxially costa prominent and secondary veins and remaining venation prominulous; margins entire; *petioles* 5–16 mm long; *stipules* interpetiolar, caducous, ovate to ligulate, 10–18 mm long, obtuse to rounded, in basal portion tomentellous, distally glabrous. *Inflorescences* terminal, paniculate, hirtellous to tomentellous; peduncle 2–4.5 cm long; branched portion pyramidal, ca. 10 × 12 cm, secondary axes paired; bracts deltoid, 0.5–1 mm long. *Flowers* sessile in hemispherical to subglobose glomerules of 5 to 11; hypanthium turbinate, 0.5–0.8 mm long, densely hirtellous to tomentellous; *calyx limb* puberulous to glabrescent, ca. 0.5 mm long, truncate to denticulate; *corolla* funnelform, white, externally glabrous, internally densely pubescent at stamen insertion, tube ca. 2.5 mm long, lobes 5, ca. 2 mm long, abaxially with a small thickening on upper middle portion; anthers ca. 1 mm long, exserted shortly; stigmas ca. 0.5 mm long, included, situated in upper part of corolla tube. *Infructescences* similar to inflorescences. *Fruits* ellipsoid, ca. 5 × 4 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 low rounded ridges, ventrally plane.

Habitat, distribution, and phenology. Wet montane forests and cloud forests, 1500–1920 m, central Cordillera Occidental of Colombia; collected in flower in July, in fruit in April and December.

This new species is distinguished by its secondary and tertiary leaf veins that are abaxially prominent and adaxially shallowly sulcate in somewhat irregular areoles, and its flowers borne in dense glomerules. In general aspect, this new species is similar to several other montane species of *Psychotria* subg. *Psychotria*, especially *P. rugulosa*, which also sometimes has the leaf venation shallowly sulcate adaxially. *Psychotria rugulosa* can be separated from this new species by its narrower leaves, 1.5–4 cm wide, with usually fewer secondary veins, 8 to 12 pairs; its flowers that are subsessile and pedicellate in dichasial cymules; and its longer corolla tubes, 3–4 mm long. All the flowers of *P. areolata* seen resemble the short-styled form of distylous *Psychotria* species, but whether this new species is distylous cannot be determined from the few collections available.

Paratypes. COLOMBIA. **Valle del Cauca:** Santa Helena, above Topacio, edge of Los Farallones de Cali Nat. Park, 3°30′N, 76°35′W, *A. Gentry & M. Monsalve 53189* (MO); Río Bravo, NW of Darién, *J. W. L. Robinson 99* (US).

Psychotria ceronii C. M. Taylor, sp. nov. TYPE: Ecuador. Napo: cantón Tena, Estación Biológica Jatun Sacha, Río Napo, 8 km al E de Misahuallí, 1°04′S, 77°36′W, 400 m, 19–23 Mar. 1989, *C. Cerón 6318* (holotype, MO-5067253). Figure 2G–I.

Haec species a *Psychotria acreana* foliorum venis secundariis multioribus in venam submarginalem convergentibus, inflorescentia majore atque corolla longiore; a *P. megistophylla* Standley foliis basi obtusis usque cuneatis, venis secundariis paucioribus atque stipulis minoribus distinguitur.

Shrub or small tree to 5 m tall; stems glabrous. *Leaves* elliptic to broadly elliptic or elliptic-oblong, 14–33 × 6–19 cm, at apex acute to shortly acuminate, at base obtuse to cuneate, drying papyraceous, glabrous on both surfaces; secondary veins 13 to 21 pairs, uniting in a well-developed undulating submarginal vein, in abaxial axils without domatia or perhaps with shallow cavities, adaxially venation plane or costa prominulous, abaxially costa prominent, secondary veins prominulous, and remaining venation plane to thickened; margins entire; *petioles* 10–45 mm long; *stipules* interpetiolar, caducous, ovate to suborbicular, 6–15 mm long, glabrous, obtuse to rounded, entire to crisped or a little erose, usually bicostate in basal half. *Inflorescences* terminal, paniculate, glabrous to puberulous; peduncle 3.5–25 cm long; branched portion pyramidal, 16–30 × 20–40 cm, secondary axes 4 per node in strongly unequal pairs; bracts triangular, 0.1–1 mm long; pedicels 1–2 mm long. *Flowers* pedicellate in umbelliform cymules; hypanthium cylindrical, ca. 1 mm long, glabrous to puberulous; *calyx limb* 0.5–0.8 mm long, glabrous to puberulous, denticulate to shallowly lobed, entire to ciliolate; mature *corolla* not seen, corolla in bud funnelform, yellow to yellow-orange,

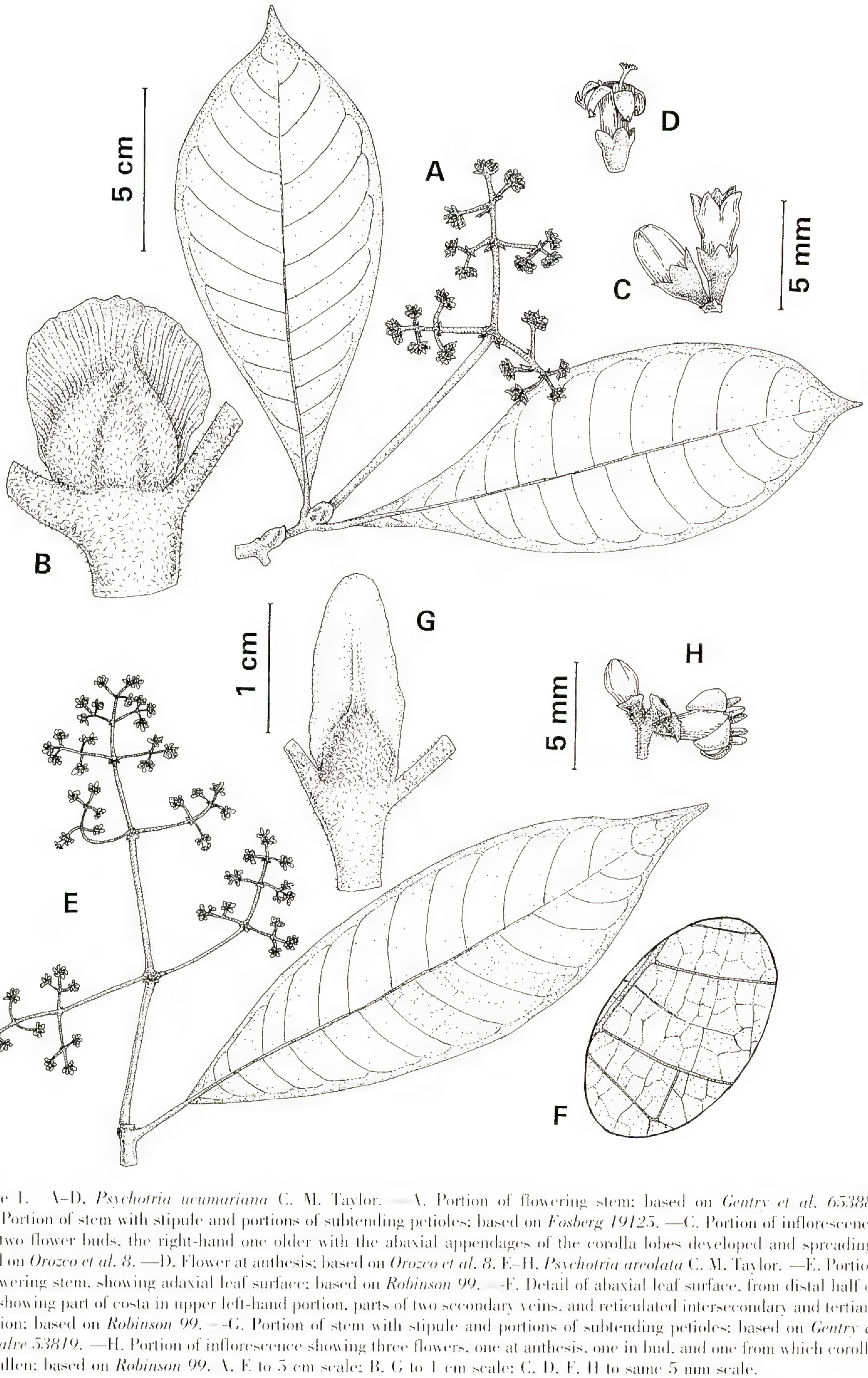

Figure 1. A–D. *Psychotria ucumariana* C. M. Taylor. —A. Portion of flowering stem; based on *Gentry et al. 65388*. —B. Portion of stem with stipule and portions of subtending petioles; based on *Fosberg 19123*. —C. Portion of inflorescence with two flower buds, the right-hand one older with the abaxial appendages of the corolla lobes developed and spreading; based on *Orozco et al. 8*. —D. Flower at anthesis; based on *Orozco et al. 8*. E–H. *Psychotria areolata* C. M. Taylor. —E. Portion of flowering stem, showing adaxial leaf surface; based on *Robinson 99*. —F. Detail of abaxial leaf surface, from distal half of leaf, showing part of costa in upper left-hand portion, parts of two secondary veins, and reticulated intersecondary and tertiary venation; based on *Robinson 99*. —G. Portion of stem with stipule and portions of subtending petioles; based on *Gentry & Monsalve 53819*. —H. Portion of inflorescence showing three flowers, one at anthesis, one in bud, and one from which corolla has fallen; based on *Robinson 99*. A, E to 5 cm scale; B, G to 1 cm scale; C, D, F, H to same 5 mm scale.

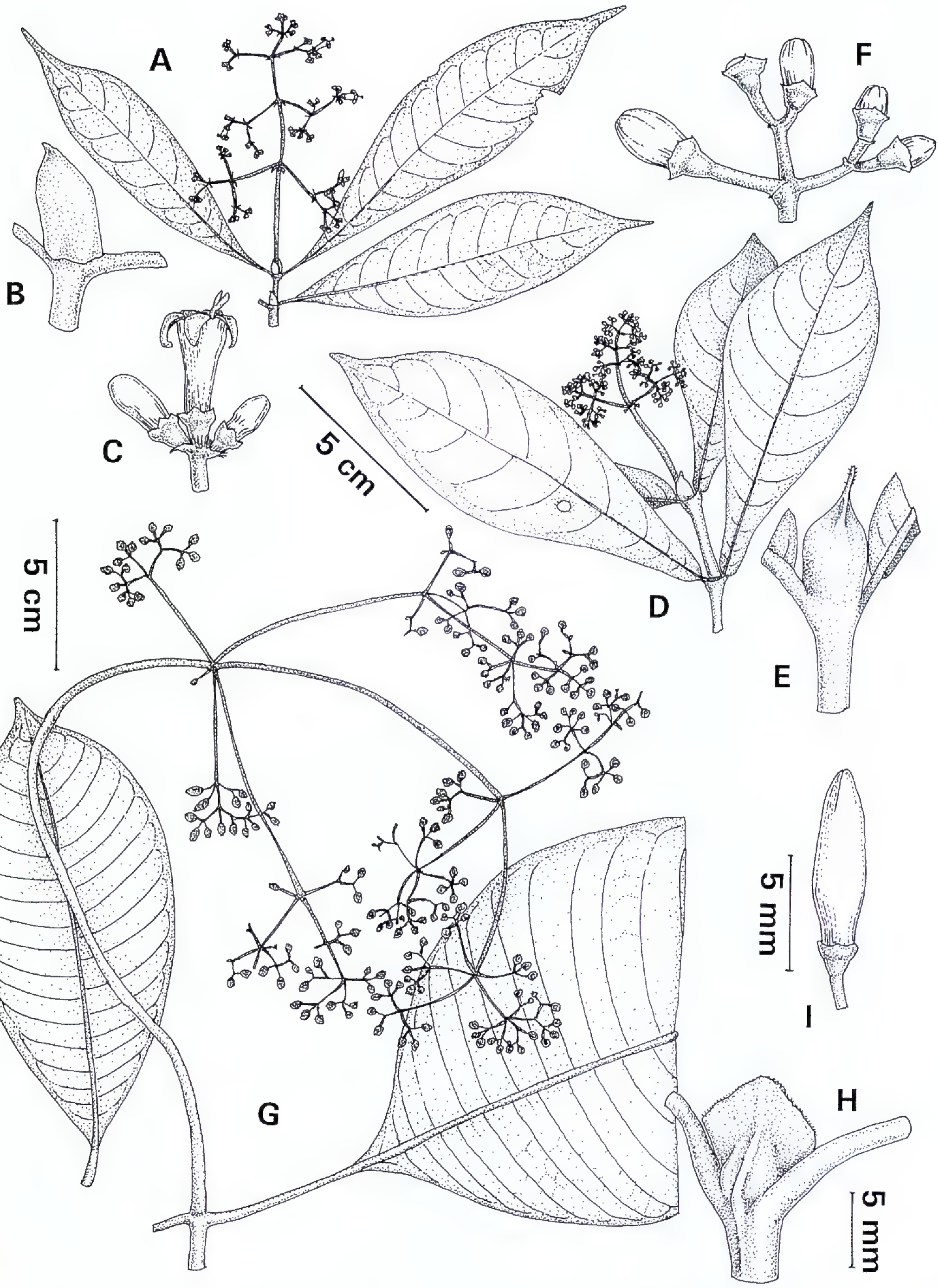

Figure 2. A–C, *Psychotria convergens* C. M. Taylor. —A. Portion of flowering stem; based on *McPherson 13451*. —B. Portion of stem with stipule and portions of subtending petioles; based on *McDade 1066*. —C. Portion of inflorescence with one flower at anthesis and two flower buds; based on *McDade 1066*. D–F, *Psychotria esmeraldana* C. M. Taylor. —D. Flowering stem; based on *Bass & Pitman 244*. —E. Portion of stem with stipule and portions of subtending leaves; based on *Bass & Pitman 244*. —F. Portion of inflorescence with one flower from which the corolla has fallen and four flower buds; based on *Carvajal 7*. G–I, *Psychotria ceronii* C. M. Taylor. —G. Portion of fruiting stem; based on *Knapp et al. 7714*. —H. Portion of stem with stipule and portions of subtending petioles; based on *Timaná & Astete 659*. —I. Flower bud; based on *Ceron 6318*. A, D to same 5 cm scale; B, C, E, F, H to same 5 mm scale; G to adjacent 5 cm scale; I to adjacent 5 mm scale.

externally glabrous, internally densely pilosulous at ca. 1/3 of length of tube above base (at stamen insertion), tube to 6 mm long, lobes to 2.5 mm long, abaxially with a rounded appendage to 0.5 mm long on upper middle portion; anthers in bud ca. 2.2 mm long, included, situated just above middle of corolla tube; stigmas in bud ca. 1 mm long, situated at same level as anthers. *Infructescences* similar to inflorescences or often displaced to a pseudoaxillary position by subsequent growth. *Fruits* ellipsoid, ca. 4.5 × 4 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 sharp ridges, ventrally plane except with a shallow longitudinal sulcus.

Habitat, distribution, and phenology. Wet forests at 400–750 m, eastern Andean slopes of Ecuador and Peru; collected in flower in March and April, in fruit in June and July.

This species has been confused with *Psychotria acreana*, but *P. acreana* is found in wet lowland forests of the western Amazon basin and can be separated from *P. ceronii* by its fewer secondary leaf veins, 8 to 12 pairs, that are free or loop only weakly to interconnect; its generally smaller inflorescences, with the branched portion 13–18 × 13–22 cm; and its shorter corolla tubes, 2.5–3 mm long. Also similar to this new species is *P. megistophylla* Standley from Panama, western Colombia, and northwestern Ecuador, but *P. megistophylla* can be separated from *P. ceronii* by its leaves that are abruptly obtuse to rounded or cordulate at the base and have more numerous secondary veins, 36 to 44 pairs, as well as by its larger stipules, 28–45 mm long.

Psychotria ceronii shows notable variation in leaf size and number of secondary veins. The stigmas and anthers have been seen only in flower buds, where they are held at the same level in contrast to their separated positions in distylous flowers. However, it is possible that *P. ceronii* is actually distylous, and that as the flower buds mature the style elongates and finally positions the stigmas above the anthers as in long-styled flowers of distylous species.

Paratypes. ECUADOR. **Napo:** Loreto, faldas del Volcán Sumaco al E de Avila Viejo, 00 38′S, 77 27′W, *E. Freire & P. Cerda 108* (MO); Archidona, al SE del Volcán Sumaco, carr. Hollín-Loreto, km 65, Huaticocha, 00 45′S, 77 28′W, *F. Hurtado 2352* (MO); Parque Nac. Sumaco Napo-Galeras, 00 53′S, 77 33′W, *E. Freire & J. Cerda 418* (MO). PERU. **Amazonas:** Bagua, slopes of Cerro Unki (or Pumpuntas), km 44 of Sarameriza–Chiriaco, ca. 52 km NE of bridge over Río Nieva, 4 40′S, 77 38′W, *S. Knapp, P. Akoru & J. Mallet 7714* (MO). **Cuzco:** Quispicanchi, Camanti, Maniri, 8 km O de Quincemil, 13 17′S, 70 48′W, *M. Timaná & H. Astete 605* (MO), *659* (MO). **San Martín:** Mariscal Cáceres, Tocache Nuevo, Palo Blanco, *J. Schunke V. 5608* (MO).

Psychotria convergens C. M. Taylor, sp. nov. TYPE: Ecuador. Pichincha: cantón Quito, Reserva Orquidológica El Pahuma, carretera Calacalí Los Bancos, Km 22, 00 02′N, 78 38′W, 2000 m, 6 Nov. 1999, *A. Cedeño & Grupo Post-Grado MO-QCNE 10* (holotype, QCNE; isotype, MO-5873158). Figure 2A–C.

Haec species a *Psychotria sylviraga* inflorescentiae axibus pubescentia hirtella sparsa densave vestitis atque tubo corollino 6–10 mm longo distinguitur.

Shrub or small tree to 5 m tall; stems densely hirtellous or short-pilosulous to glabrous. *Leaves* elliptic to oblanceolate, 5–14 × 1.2–6 cm, at apex acute to acuminate, at base acute to cuneate, drying papyraceous, adaxially glabrous, abaxially glabrous or costa and secondary veins sparsely to densely hirtellous or short-pilosulous; secondary veins 6 to 11 pairs, usually looping to interconnect, in abaxial axils without domatia or with domatia in the form of cavities usually with tufts of denser pubescence in or next to them, adaxially venation plane or costa shallowly sulcate, abaxially costa prominent, secondary veins and often intersecondary veins prominulous, and remaining venation plane; margins plane or shortly revolute; petioles 3–15 mm long; *stipules* interpetiolar, caducous, ovate to rather broadly triangular, 7–13 mm long, glabrous or densely hirtellous near base, acute or usually shortly bidentate, the teeth triangular, 0.5–1 mm long, margins (of stipule) entire. *Inflorescences* terminal, paniculate to densely or sparsely hirtellous with pubescence present at least in lines along higher order axes, often becoming glabrescent with age; peduncle 1–8 cm long; branched portion pyramidal, 1.5–5 × 2–7.5 cm, secondary axes paired; bracts triangular to narrowly triangular, 1.5–4 mm long; pedicels 0–1 mm long. *Flowers* distylous, sessile and shortly pedicellate in dichasial cymules of 3 to 9; hypanthium turbinate to cupuliform, ca. 1 mm long, glabrous; *calyx limb* glabrous, 1.2–1.5 mm long, lobed for 1/2–3/4 of its length; *corolla* tubular, white to cream-yellow, externally glabrous, internally densely pubescent in a ring near or above middle of tube, tube 6–10 mm long, lobes 5, 2–2.5 mm long, abaxially smooth or with a small thickening on upper middle portion; anthers in short-styled form ca. 1.5 mm long and shortly to well exserted, in long-styled form ca. 1.5 mm long and included; stigmas in short-styled form ca. 1.2 mm long and included, situated just above middle of corolla tube, in long-styled form ca. 0.8 mm long and exserted. *Infructescences* similar to inflorescences. *Fruits* subglobose to ellipsoid, 6–7 × 5–6 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 rounded ridges, ventrally plane.

Habitat, distribution, and phenology. Wet montane forests at 2000–3000 m, Costa Rica to southern Ecuador and northern Peru; collected in flower February through September, in fruit March, April, July through September, and November.

The inflorescences of this species are at least sometimes pendulous (e.g., *McDade 1006*, MO), and this orientation together with the relatively long corolla tubes (for this group) suggest that this species may be adapted for hummingbird pollination. Corollas of similar size and color are found in some species of *Palicourea* Aublet that are visited by hummingbirds (e.g., *Palicourea garciae* Standley). These apparent adaptations for hummingbird pollination are convergent in *Palicourea* and *Psychotria convergens*, and the epithet of this new species refers to this similarity.

This new species has been previously confused with *Psychotria sylvivaga*, but it can be separated by its sparse to dense hirtellous pubescence on the inflorescences axes (sometimes this is reduced to lines along the higher order axes, but it is present) and usually (though not always) on the abaxial leaf veins, together with its longer corollas, with tubes 6–10 mm long, that are internally pubescent in a ring near the middle. In contrast, *P. sylvivaga* has inflorescences axes and abaxial leaf surfaces that are glabrous to uniformly puberulous and shorter corollas, with tubes 4–5 mm long, that are densely hirtellous above the middle.

Paratypes. COLOMBIA. **Antioquia:** Granja Forestal Univ. Nac., Antigua Carr., Medellín–Guarne, *R. Fonnegra & Curso de Palinología 2221* (MO); Entrerríos, road betw. Entrerríos & San Pedro, 12 km from center of Entrerríos, *J. M. MacDougal & F. J. Roldán 3676* (MO); Frontino, region of Murrí, ca. 12 road-km from Nutibara, *G. McPherson 13451* (MO). **Cauca:** El Tambo, Parque Nac. Munchique, trail to Nueva Granada, *L. Andersson, F. González, C. Gustafsson, C. Persson & J. H. E. Rova 2122* (MO). **Valle del Cauca:** Palmira, Res. La Sirena, quebrada los Cuzumbos, *L. F. Prado & H. Berrio 335* (MO); Res. Nat. "Hato Viejo," Parque Nacional Natural Farallones de Cali, *U. Schmitt 108* (MO); El Cairo, Cerro del Inglés, Serranía de los Paraguas, a 1 hora en jeep de El Cairo, *P. A. Silverstone-Sopkin N. Paz, R. Eriksson & J. Knudsen 3833* (CUVC, MO). COSTA RICA. **Limón:** Cordillera de Talamanca, headwaters of unnamed W branch of Río Teribe, betw. Río Sini & Continental Divide at Cerro Bekom, *G. Davidse, G. Herrera Ch. & R. H. Warner 25751* (MO); Valle de Silencio, area just N of Cerro Hoffman, *G. Davidse, G. Herrera Ch. & M. H. Grayum 28628* (MO); Kamuk massif, ridge betw. Río Tararia & NE-most Kamuk páramo, *G. Davidse & G. Herrera Ch. 29227* (MO); Talamanca, Parque Nac. La Amistad, Tararia, Valle del Silencio, sendero a Cerro Tararia, *B. Gamboa R., O. Esquivel, R. Villalobos & J. S.* [sic; no surname given] *1220* (MO). **Limón-Puntarenas Border:** Cordillera de Talamanca, Cerro Bekom, 11 airline km SSW of peak of Cerro Kámuk, *G. Davidse 25711* (MO). **Puntarenas:** Coto Brus, Parque Internac. La Amistad, Valle del Silencio, Río Terbi, *J. F. Morales & F. Quesada 5799* (MO). ECUADOR. **Azuay:** NE of Cuenca, 32 km beyond town of Paute, ca. 2 km past town of Sevilla de Oro, *L. A. McDade 1066* (MO); Sevilla de Oro & vicinity, *W. H. Camp E-4500* (AAU, MO, NY, S), *E-4668* (S), *E-4775* (AAU, MO, S), *E-5280* (AAU, MO), *E-5283* (S). **Carchi:** across Río Plata from Tambo La Palma, *W. C. Steere 8093* (F, S); above Río Cofanes below San Antonio, *W. C. Steere 8135* (F); Cerro Golondrinas, *B. Boyle, A. Boyle, J. Bradford & N. Skinner 3431* (MO); Espejal, El Gualtal, Faldas de Cerro Golondrina Hembra, *W. Palacios 12616* (MO). **Imbabura:** Cotacachi, Plaza Gutiérrez, sector Tabla Chupa, *G. Tipaz & E. Gudiño 1194* (MO). **Loja:** crest of Cordillera de Zamora, E of Loja, *W. H. Camp E-85* (NY); Parque Nac. Podocarpus, *J. Jaramillo, V. Zak, & R. Valencia 8780* (AAU, MO, NY); Cerro Uritusinga, Loja–La Palma km 18–20, *P. Jørgensen, C. Ulloa, S. León, H. Vargas & P. Lozano 1079* (MO). PANAMA. **Bocas del Toro:** Valle de Silencio, *T. Antonio 1586* (MO), *1615* (MO). PERU. **Amazonas:** Bagua, Cordillera Colán SE of La Peca, *P. Barbour 3833* (MO).

Psychotria cutucuana C. M. Taylor, sp. nov. TYPE: Ecuador. Santiago-Zamora (Oriente) [sic; i.e., Morona-Santiago]: Cordillera Cutucú, ridge between Ríos Itzintza & Chupiasa, ca. 2°40′S, 78 W, 4000–4500 ft., 17 Nov.–1 Dec. 1944, *W. H. Camp E-1272* (holotype, US). Figure 3E–H.

Haec species a congeneris aequatorialibus foliis sat angustis, stipulis bene evolutis atque inflorescentia pseudoaxillari pedunculo sat longo insidente distinguitur.

Shrub or subshrub to 1.5 m tall; stems glabrous. *Leaves* narrowly elliptic, 13–29 × 2.3–7.2 cm, at apex acute to acuminate, at base acute, drying papyraceous, adaxially glabrous, abaxially densely puberulous on costa and secondary veins and sparsely puberulous to glabrous on lamina; secondary veins 16 to 23 pairs, looping to interconnect, without domatia, adaxially venation plane or costa thickened, abaxially costa prominent, secondary veins prominulous, and remaining venation plane to thickened; margins plane; *petioles* 15–32 mm long; *stipules* interpetiolar, caducous or often persisting on 2–3 apical nodes, ligulate to lanceolate, 18–25 mm long, puberulous to glabrous, acute to bidentate with teeth to 2 mm long, entire. *Inflorescences* pseudoaxillary and pendulous, paniculate, hirtellous, becoming glabrescent with age; peduncle 8–20 cm long, flexuous; branched portion pyramidal, 4–10 × 4–10 cm, secondary axes paired; bracts narrowly triangular, those subtending secondary axes 3–12 mm long, those subtending flowers 1–2.5 mm long. *Flowers* sessile in congested dichasial cymules of 3 to 7; hypanthium turbinate, ca. 0.8 mm long, glabrous to puberulous; *calyx limb* 1–1.5 mm long, glabrous to puberulous, dentate; *corolla* tubular, white or lobes green, externally glabrous, internally densely pilosulous at stamen insertion, tube ca. 2 mm long, lobes 5, ca. 1.5 mm long, abaxially with a conical thickening 0.3–0.5 mm long on upper middle portion; anthers ca. 1 mm long, partially to fully exserted; stigmas ca. 0.2 mm long, apparently exserted. *In-*

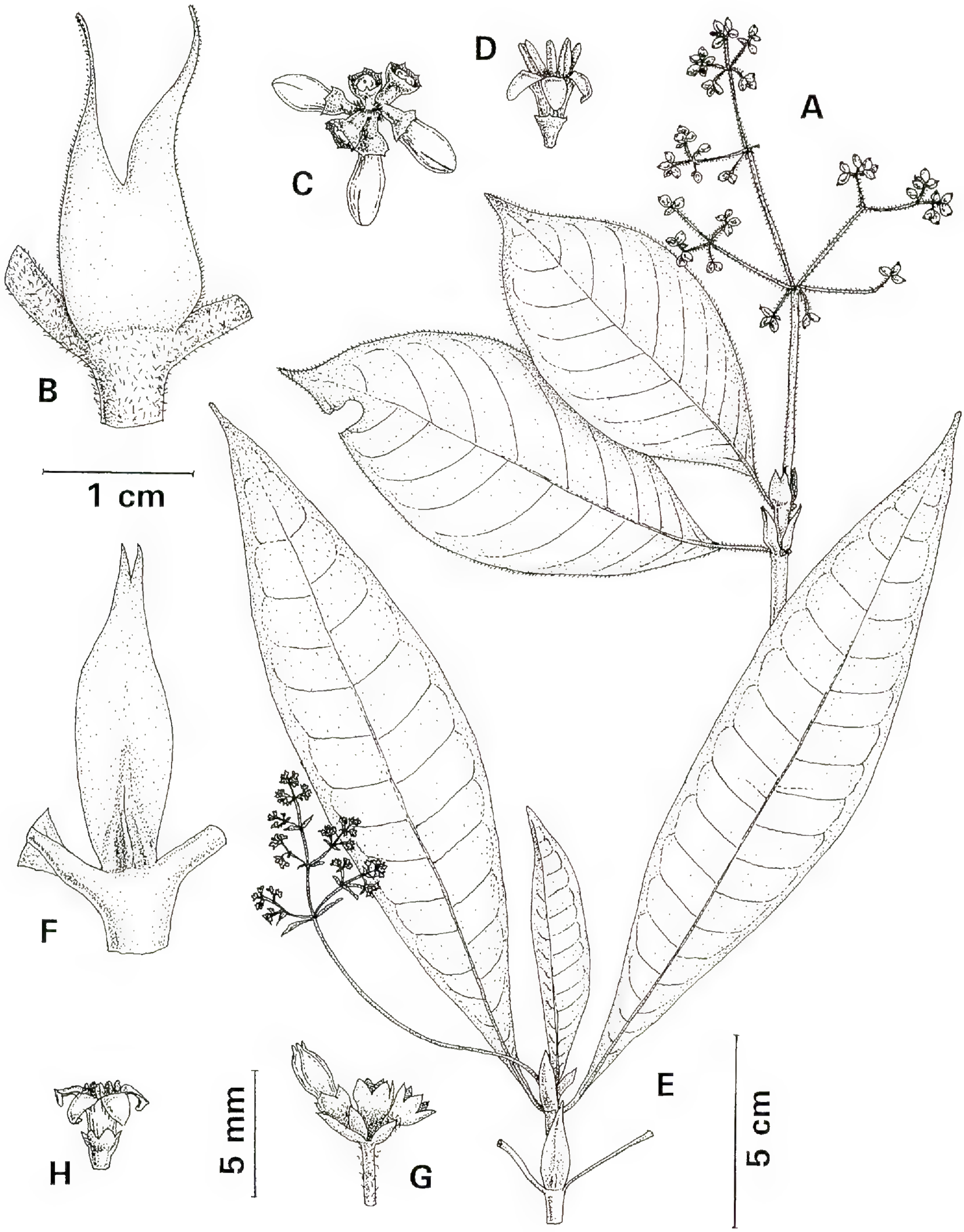

Figure 3. A–D. *Psychotria paravillosa* C. M. Taylor. —A. Portion of fruiting stem; based on *Neill & Palacios 6736*. —B. Portion of stem with stipule and portions of subtending petioles; based on *Clark et al. 1047*. —C. Portion of inflorescence with three flower buds and three old flowers from which corollas have fallen; based on *Clark et al. 1047*. —D. Flower at anthesis; based on *Clark et al. 1047*. E–H. *Psychotria cutucuana* C. M. Taylor; based on *Madison et al. 3424*. —E. Flowering stem. —F. Portion of stem with stipule, portion of a subtending petiole, and portion of a subtending leaf. —G. Portion of inflorescence with one flower bud and two old flowers from which corollas have fallen. —H. Flower at anthesis. A, E to 5 cm scale; B, F to 1 cm scale; C, D, G, H to 5 mm scale.

fructescences similar to inflorescences. *Fruits* ellipsoid, ca. 6 × 5.5 mm, glabrous, color unknown; pyrenes 2, dorsally with 4 to 5 rounded ridges, ventrally plane.

Habitat, distribution, and phenology. Wet forests at 450–1750 m, known only from Ecuador; collected in flower November and December, in fruit in May, November, and December.

This new species can be recognized by the combination of its relatively narrow leaves, well-developed stipules that frequently persist on the distalmost nodes, and its pseudoaxillary inflorescences with relatively long peduncles. It is similar in its rather low habit, well-developed papery stipules, and pseudoaxillary inflorescences to several species of *Notopleura* (Bentham & Hooker fils) Bremekamp. However, its stipules that are not glandular and enclose a ring of persistent short trichomes, its brown drying color, and its pyenes without marginal preformed germination slits show its affinities are instead with *Psychotria* subg. *Psychotria*. *Psychotria cutucuana* is known from the Andes and the Cordillera Cutucú; its epithet refers to the latter locality.

Paratypes. ECUADOR. **Azuay:** Loma de la Plata, slopes bordering Río Putucay, at Chancanceo, *J. A. Steyermark 52673* (F). **Guayas:** Res. Ecol. Churute, Cerro Pancho Diablo, *X. Cornejo & C. Bonifaz 5530* (GUAY). **Morona-Santiago:** Cordillera Cutucú, ridge ascending into central Cutucú, *W. H. Camp E-1160* (NY); Cordillera de Cutucú, W slopes along a trail from Logroño to Yaupi, 2 46′S, 78 06′W, *M. T. Madison, E. O. Bush III & E. W. Davis 3424* (US), *3479* (US).

Psychotria esmeraldana C. M. Taylor, sp. nov. TYPE: Ecuador. Esmeraldas: cantón Quinindé, Bilsa Biol. Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, Old Mono Road, 3–5 km SW of the station, 00°21′N, 79°44′W, 400–600 m, 13 Nov. 1994, *M. S. Bass & N. Pitman 244* (holotype, QCNE; isotype, MO-4913342). Figure 2D–F.

Haec species a *Psychotria orosiana* stipulis uni- (nec bi-) aristatis atque foliis abaxialiter efoveolatis distinguitur; etiam in Aequatoria crescit.

Shrub or small tree to 1 m tall; stems glabrous. *Leaves* oblanceolate to elliptic-oblong, 4–12.5 × 1.5–4 cm, at apex acute to shortly acuminate, at base tapered then shortly and abruptly obtuse to rounded, drying papyraceous, adaxially glabrous, abaxially glabrous or puberulous to pilosulous on costa and secondary veins; secondary veins 6 to 10 pairs, looping to interconnect, without domatia, adaxially venation plane or costa prominulous, abaxially costa prominent, secondary veins prominulous, and remaining venation plane; margins plane to crisped; *petioles* 2–3 mm long; *stipules* caducous, interpetiolar, triangular to ovate, the body 4–7 mm long, glabrous to densely hirtellous, usually costate, acute to usually aristate, with arista 2–3 mm long, hirtellous to glabrescent. *Inflorescences* terminal, paniculate, glabrous; peduncle 0.8–3.5 cm long; branched portion pyramidal, 3–7 × 3.5–8 cm, with secondary axes paired; bracts triangular to linear, 0.3–1 mm long; pedicels 1–2 mm long. *Flowers* pedicellate in umbelliform cymules of 2 to 5; hypanthium turbinate, 0.8–1 mm long, glabrous; *calyx limb* 0.3–0.5 mm long, undulate to dentate; mature *corolla* not seen, corolla in young bud externally glabrous, with tube to 1 mm long, lobes 5, to 2 mm long, abaxially smooth; anthers and stigmas not seen. *Infructescences* similar to inflorescences. *Fruits* ellipsoid, 5–6 × 4.5 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 rounded ridges, ventrally plane with a shallow central depression.

Habitat, distribution, and phenology. Wet premontane forests of northwestern Ecuador and western Colombia at 80–900 m; collected with flower buds January, April, November, and December, with fruit February, April, July, September, and November.

This new species is distinctive due to its relatively small, generally oblanceolate leaves that are narrowed to an abruptly rounded or obtuse base. This species is similar to *Psychotria orosiana*, of Costa Rica and western Panama; *P. orosiana* differs from this new species in its bi-aristate stipules and well-developed foveolate domatia. This new species is also similar to *P. orosioides* C. M. Taylor of Costa Rica; *P. orosioides* can be separated by its bi-aristate stipules and calyx limbs 1.2–2 mm long.

Paratypes. COLOMBIA. **Chocó:** left bank of Río Baudó, ca. 6.5 km upstream from estuary near quebrada Chigoul, *H. P. Fuchs & L. Zanella 22095* (MO). ECUADOR. **El Oro:** 10 km W of Pinas, *C. H. Dodson, A. Gentry & G. Shupp 8966* (MO). **Esmeraldas:** San Lorenzo, Res. Etnica Awá, 1°15′N, 78 40′W, *C. Aulestia, G. Tipaz, L. Delgado & G. Lao 221* (MO); San Miguel, Río Cayapas, sector Loma Linda, 00 45′N, 78 47′W, *G. Tipaz, P. Méndez, H. Vargas & M. Chapiro 2265* (MO); Quinindé, Bilsa Biol. Sta., Montañas de Mache, 35 km W of Quinindé, 00 21′N, 79 44′W, *J. L. Clark & B. Adnepos 85* (MO), *J. L. Clark & Y. Troya 685* (MO), *J. L. Clark, E. Austen, S. Bennett & D. Kapan 3751* (MO), *W. Palacios & N. Jaramillo 13580* (MO), *N. Pitman, J. [L.] Clark & B. Adnepos 683* (MO); Quinindé, carr. vecinal Herrera–Los Monos, cabecera del Río Aguacatal, 00°20′N, 79 46′W, *W. Palacios 13691* (MO). **Pichincha:** Cooperativa Santa Marta #2 along Río Verde 2 km SE of Santo Domingo de los Colorados, *C. H. Dodson 7422* (MO); within 3 km of Santo Domingo de Colorado [sic; de los Colorados], *E. L. Little Jr. 6119* (F); Río Chiquilpe near jct. with Río Baba, 7 km E of km 7 on hwy. Santo Domingo–Quevedo, *C. H. Dodson, M. Fallen & P. Morgan 7856* (F, MO); Res. For. Endesa, Río Silanche, Km 113 de la carr. Quito–Puerto Quito, 00 5′N, 79 02′W, *C. Carvajal 7* (AAU, MO), *J. Jaramillo 7460* (MO).

Psychotria montivaga C. M. Taylor, sp. nov. TYPE: Ecuador. Zamora-Chinchipe: area of Estación Científica San Francisco, 35 km from Loja on road Loja–Zamora, 3°58′S, 79°04′W, 1930 m, 20 Apr. 2003, *J. Homeier 1224* (holotype, MO-5679313). Figure 4A–C.

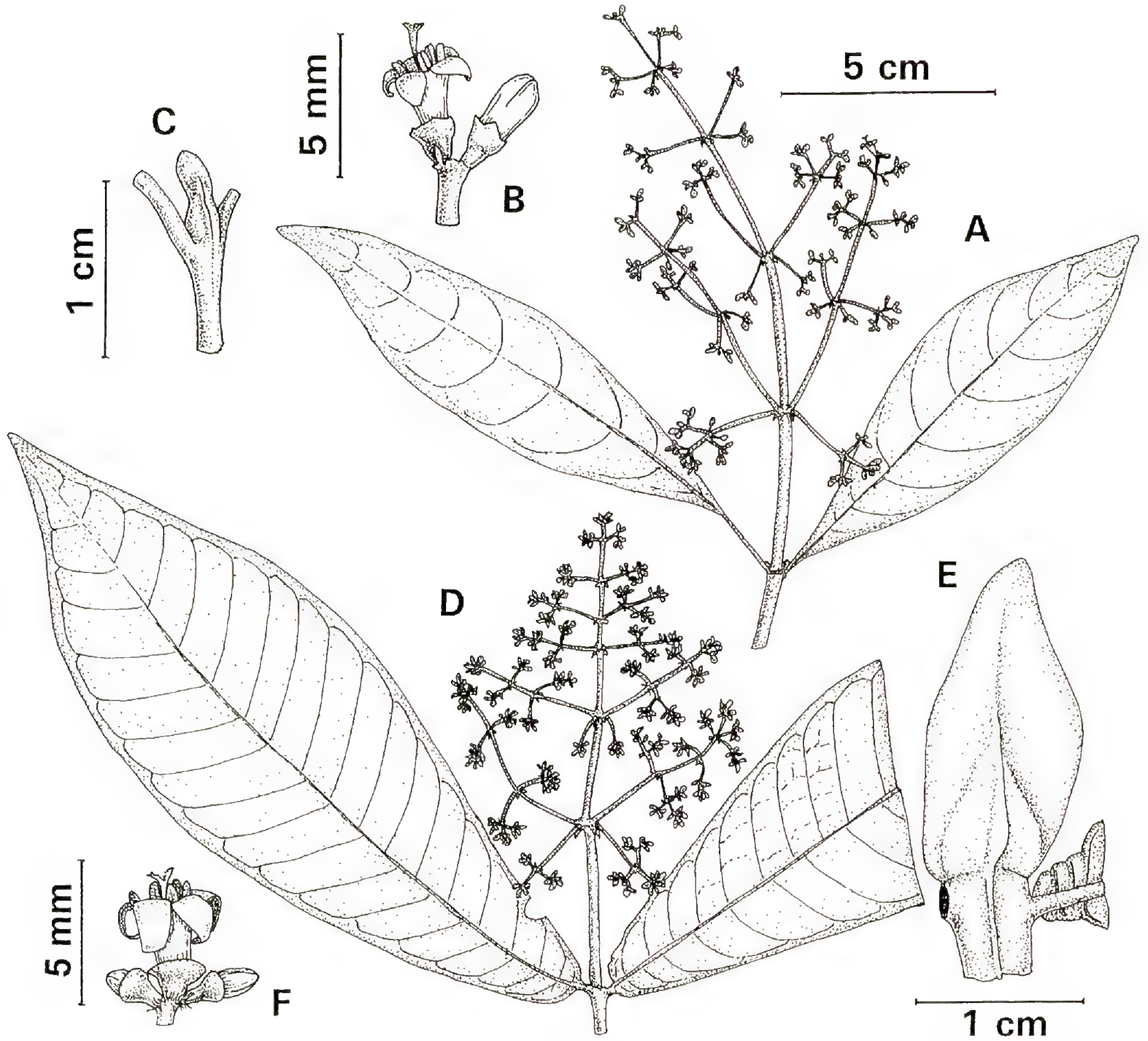

Figure 1. A–C. *Psychotria montiraga* C. M. Taylor. —A. Flowering stem; based on *Homeier 1224*. —B. Portion of inflorescence with one flower bud and one flower at anthesis; based on *Homeier 1224*. —C. Portion of stem with stipule and portions of subtending petioles; based on *Wolff 50*. D–F. *Psychotria puyoana* C. M. Taylor; based on *Hudson 819*. —D. Flowering stem. —E. Portion of stem with stipule and portion of one subtending leaf. —F. Portion of inflorescence with one flower at anthesis and two flower buds. A, D to 5 cm scale.

Haec species a *Psychotria alba* et *P. carthagenensi* venatione tertiaria et ordinum altiorum non manifesta distinguitur; etiam sylvas premontanas montanasque habitat.

Shrub or small tree to 7 m tall; stems densely hirtellous or puberulous to glabrous. *Leaves* elliptic, 6–19 × 2–8.5 cm, at apex acute to a little acuminate, at base obtuse to acute, drying papyraceous, adaxially glabrous, abaxially glabrous to puberulous or hirtellous at least on principal veins; secondary veins 7 to 13 pairs, free or usually looping to interconnect, in abaxial axils without domatia or occasionally with a cavity under expanded tissue or rarely with small foveolae, these opening apically, adaxially venation plane, abaxially costa prominent, secondary veins prominulous, and remaining venation plane and not evident or sometimes a few intersecondary veins present and prominulous; margins plane, entire; *petioles* 5–18 mm long; *stipules* interpetiolar, caducous, ligulate to ovate or elliptic, 5–20 mm long, glabrous to hirtellous or puberulous in basal portion, obtuse to rounded, entire to ciliolate at least at apex, smooth or a little costate near base, in bud apparently convolute. *Inflorescences* terminal, paniculate, hirtellous to puberulous; peduncle 2.5–7 cm long; branched portion 6–15 × 4–12 cm, secondary axes 4 per node in unequal pairs; bracts triangular, 0.2–1 mm long; pedicels 0–1 mm long. *Flowers* distylous, sessile to pedicellate in dichasial cymules of 3 to 9; hypanthium turbinate, ca. 1 mm long, puberulous to glabrous; *calyx limb* 0.5–0.8 mm long, puberulous to glabrous, truncate to denticulate; *corolla* funnelform, yellow-green to white or pale green, externally glabrous, internally densely pilosulous at stamen insertion, tube 1.5–2 mm long, lobes 5, ca. 1.5 mm long, abaxially smooth; *anthers* ca. 2 mm long, partially exserted; stigmas ca. 1 mm long, exserted and

held above anthers. *Infructescences* similar to inflorescences. *Fruits* subglobose to ellipsoid, 4–7 × 3.5–6 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 low rounded ridges, ventrally plane.

Habitat, distribution, and phenology. Wet premontane and montane forest at 1200–2430 m, central Colombia to central Peru; collected in flower February to April, August, September, and December, in fruit often concurrently, in February, April, June, September to December.

In spite of its frequent collection, there does not seem to be a previous name for this new species; this lack is probably due to its long confusion with *Psychotria carthagenensis* and *P. alba*. The specific epithet of this new species refers to its montane habitat and rather wide geographic distribution. *Psychotria montivaga* can be separated from *P. alba* and *P. carthagenensis* by its habit in wet premontane and montane forest at higher elevations and its tertiary leaf venation that is not visible; these other two species are found in lowland wet to seasonal forest, 0–1800 m, and have the tertiary venation visible on the abaxial leaf surfaces. This new species is most similar to *P. alba*, but can be separated from that also by its flowers borne mixed sessile and shortly pedicellate in dichasial cymules, versus flowers all sessile or subsessile in *P. alba*. In *P. montivaga* often the terminal flower of a cymule is pedicellate and the younger flowers are sessile, although in most species of *Psychotria* subg. *Psychotria* the terminal flower of the cymule is sessile, whereas the younger flowers may be sessile or pedicellate. One collector (*Wolff 50, 165*) reported that the flowers are distylous, but the specimens seen only have corollas in bud and, among the mature flowers seen, all are similar to the long-styled form of other species. It seems most likely that this species is indeed distylous, but because of the limitations of the dried specimens available measurements cannot be provided here for the short-styled floral form.

Paratypes. COLOMBIA. **Nariño:** Ricaurte, Res. Nat. La Planada, vertiente occidental, Cordillera Occidental, *O. de Benavides 8890* (MO), *C. Restrepo 423* (MO). ECUADOR. **Cotopaxi:** Sigcios, Latacunga, Paquia, San Francisco de la Pampa, Res. La Otonga, *P. Delprete & G. Onore 6500* (MO); Hacienda Nanaló, Macuchi Mines region, *H. C. Steere 8078* (F). **El Oro:** betw. Pampa de los Cedros, NE of San Pablo, & Curtincapa, *J. A. Steyermark 53822* (F); Cordillera de Güishagünña, E [of] Zaruma, *R. Espinosa E 1894* (F). **Imbabura:** Cotacachi, Hacienda La Florida, *A. Alvarez & R. Castro 603* (MO). **Napo:** along road betw. Baeza & Tena, 72 km N of Archidona, *T. B. Croat 49556* (MO); Quijos River region below Baeza, 10 km NW of Chaco on trail to Río San Juan, *M. Ownbey 2658* (F, MO); El Chaco, margen derecha del Río Quijos, Finca La Ave Brava de Segundo Pacheco, *W. Palacios 5339* (MO); Las Palmas, Finca Carmita de Luis Salazar, *W. Palacios 6249* (MO); Río San Juan Grande, ca. 9.5 km NW of El Chaco, *B. Ståhl, B. Øllgaard, H. Navarrete & P. Asimbaya 2181* (AAU, MO); hills above Río San Juan at confluence with Río Oyacachi, ca. 10 km W of El Chaco, *B. Ståhl, P. Asimaya, H. Navarrete & J. T. Knudsen 2362* (AAU). **Pichincha:** Quito, Chiriboga, en la carr. vieja Quito–Santo Domingo, Res. For. La Favorita, *C. E. Cerón, G. Benavides & E. Guzmán 7983* (MO), *C. E. Cerón & C. Iguago 8582* (MO), *8609* (MO); Nono, Res. Orquidológica El Pahuma, carr. Calacalí–Nanegalito km 30, *E. Freire, M. Reina & Y. Reina 1057* (MO), *W. Rojas & Grupo de Post-Grado MO-QCNE 400* (MO); Res. Florística-Ecol. Río Guajalito, a 3.5 km al NE de Km 59 de carr. antigua Quito–Santo Domingo de los Colorados, estribaciones occidentales del Volcán Pichincha, *J. Jaramillo & V. Zak 7876* (AAU, F, MO), *V. Zak & J. Jaramillo 584* (AAU, F, MO, S, US); Bosque Protector Maquipucuna, below Cerro Montecristi, ca. 7 km SE Nanegalito, *G. L. Webster & B. Castro 30616* (DAV). **Tungurahua:** El Mirador, Sierra de León, valley of Río Pastaza below Baños, *W. H. Steere & W. C. Camp 8268* (F); Baños, Los Llanganates, Colonia México, a 18 km del Topo, *H. Vargas & D. Sandoval 344* (MO). **Zamora-Chinchipe:** area of Estación Científica San Franciso, ca. 30 km from Loja, *J. Homeier 610* (MO), *D. Wolff 50* (MO), *68* (MO), *165* (MO); Zamora–Loja road, 4 02′S, 79 00′W, *J. Madsen & J. T. Knudsen 86788* (AAU). PERU. **Amazonas:** Bongara, between Río Utcubamba & Pomacocha, km 317.5 E of Olmos on Rioja rd., *P. C. Hutchison & J. K. Wright 3889* (F, MO).

Psychotria paravillosa C. M. Taylor, sp. nov. TYPE: Ecuador. Orellana: Parque Nacional Yasuní, pantano moretal km 94.9, parcela 25, 00°54′S, 79°13′W, *A. P. Yanez, M. J. Macía & la comunidad Huaorani de Dicaro 2446* (holotype, QCA; isotype, MO-4963612). Figure 3A–D.

Haec species a *Psychotria villosa* stipulis bilobis atque foliis saepe latis; a *P. romolerouxiana* C. M. Taylor foliis abaxialiter in axillis venarum domatiis carentibus, stipulis majoribus profundius bilobis atque tubo corollino breviore distinguitur.

Shrub or small tree to 6 m tall; stems glabrous or hirtellous, sometimes quickly becoming glabrescent. *Leaves* narrowly elliptic to elliptic, oblanceolate, or obovate, 7–22 × 1.8–9.5 cm, at apex acute to usually acuminate, at base acute, drying papyraceous to membranaceous, adaxially sparsely villous to glabrous except usually densely hirtellous or villous on costa, abaxially glabrous to hirtellous on costa or throughout; secondary veins 9 to 14 pairs, usually looping to interconnect at least in apical part of blade, without domatia or with deep cavities in abaxial axils, adaxially venation plane, abaxially costa prominent, secondary veins prominulous, and remaining venation plane to thickened; margins plane, ciliate; *petioles* 6–25 mm long; *stipules* usually persisting on apical 1 to 3 nodes, united around stem shortly or for up to 1/2, ligulate to obovate or ovate, 12–24 mm long, glabrous to densely hirtellous, lobed for 1/4–1/2 of its length, lobes lanceolate to narrowly triangular, acute to

acuminate, ciliolate. *Inflorescences* terminal, paniculate, hirtellous; peduncle 1–12 cm long; branched portion pyramidal, 2–8 × 2.5–8 cm, secondary axes 4 or 6 per node, in unequal pairs; bracts narrowly triangular, 0.5–2 mm long. *Flowers* sessile or subsessile in umbelliform cymules of 3 to 9, often each individual flower subtended by a ring or tuft of hirsute pubescence; hypanthium turbinate to cylindrical, ca. 0.8 mm long, glabrous; *calyx limb* 0.5–0.8 mm long, denticulate, glabrous; *corolla* funnelform, white to yellow, externally glabrous, internally hirtellous to pilose at stamen insertion, tube ca. 2 mm long, lobes 5, 1–1.5 mm long, abaxially smooth; anthers in long-styled form ca. 1.2 mm long and exserted, anthers in short-styled form ca. 0.8 mm long and included or partially exserted; stigmas in long-styled form ca. 1.2 mm long and well exserted on styles ca. 3.5 mm long, in short-styled form ca. 0.8 mm long and included or with tips situated in corolla throat. *Infructescence* similar to inflorescence. *Fruit* ellipsoid to subglobose, 4–1.5 × 4–1.5 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 rounded ridges, ventrally plane.

Habitat, distribution, and phenology. Wet forests at lake edges and seasonally inundated forest in Amazonian lowlands at 200–250 m, and in wet forests at ca. 600 m in Esmeraldas; northwestern Ecuador to northern Amazonian Peru and western Brazil; collected in flower in February, March, April, June, and July, in fruit in July and September.

This new species has been confused previously with *Psychotria villosa* (e.g., Taylor, 1997), but *P. villosa* can be separated by its calyptrate stipules and leaves 1.5–5 cm wide. The species epithet refers to the similarity between these species. This new species is also similar to *P. romolerouxiana* C. M. Taylor; *P. romolerouxiana* can be distinguished by its well-developed foveolate domatia in the abaxial vein axils, its usually shorter stipules, 6.5–14 mm long, and its longer corolla tubes, ca. 2.5 mm long. This new species is also similar to *P. mapirensis* Standley of central Peru through Bolivia; *P. mapirensis* can be separated by its larger inflorescences, 25 × 25–30 cm, and its longer calyx limbs, 1–1.5 mm long.

Plants of *Psychotria pararillosa* collected in Ecuador are generally glabrous on the stems, stipules, and leaves (except for the principal veins and margins), whereas the collection from Brazil and most of the collections from Peru are moderately to densely hirtellous throughout the vegetative organs. However, no other difference is evident between these populations, and some Peruvian plants (e.g., *Gentry & Revilla 16541*) are glabrous similarly to those from Ecuador. Similar variation in pubescence is found in a number of other species of *Psychotria* subg. *Psychotria* (e.g., Hamilton, 1989); consequently, these plants are all considered conspecific here.

Paratypes. BRAZIL. **Acre:** Manoel Urbano, Rio Purus, downstream from mouth of Rio Chandless, *D. C. Daly, R. Callejas, D. P. Gomes Silva, R. Saraiva, E. C. Oliveira & A. J. B. Santo 1151* (MO, NY). ECUADOR. **Esmeraldas:** San Lorenzo, parroquia Alto Tambo, sector El Cristal, *C. Quelal, G. Tipaz & A. Grijalva 304* (MO). **Orellana:** Laguna de Yuturi, 00 36′S, 76 01′W, *J. Jaramillo & E. Grijalva 11302* (MO, NY); Parque Nac. Yasuní, carr. y oleoducto de Maxus en construcción km 32, al S del Río Tiputini, *M. Aulestia 1679* (MO). **Pastaza:** Río Curaray, alrededores de Laguna Garzayacu, *D. Neill & W. Palacios 6736* (MO); NE of Destacamento Curaray, *L. Holm-Nielsen, J. Jaramillo & F. Coello 22060* (AAU). **Sucumbíos:** Tarapoa, *V. Cornejo 7411* (GUAY, MO); Pañacocha, *P. Delprete 6508* (MO); Sacha lodge, 3 km NW of village Añangu near Napo River, *J. L. Clark, L. Demattia & T. Miller 1047* (MO). PERU. **Amazonas:** Río Cenepa, 10–12 km S of Huampami, *B. Berlin 73* (MO); ridge above Cikan Ece Creek, *B. Berlin 1622* (MO); Quebrada Sasa, *R. Kayap 372* (MO); Río Cenepa, Isla de Chigkan, *R. Kayap 768* (MO); Río Cenepa region, Quebrada Wampushik entsa, *R. Kayap 938* (MO); Quebrada Cumup, *R. Kayap 1285* (MO); al lado de Huampami, *R. Kayap 1489* (MO); Bagua, Imaza, comunidad Aguaruna de Yamayakat, Río Marañón, *V. Jaramillo, M. Jaramillo & D. Chamit 1353* (MO), *E. Rodríguez 242* (MO), *E. Rodríguez, J. Rodríguez & E. Chavez-Agkuash 857* (MO), *891* (MO); Condorcanqui, El Cenepa, Río Cenepa, comunidad de Mamayaque, *R. Vásquez, R. Rojas, A. Peña & E. Chávez 22183* (MO), *R. Vásquez, R. Rojas, A. Peña, E. Chávez & E. Quiaco 22325* (MO), *R. Vásquez, R. Rojas & A. Peña 22688* (MO); comunidad de San Antonio, *R. Vásquez, A. Peña, E. Chávez & E. Quiaco 21051* (MO); comunidad el Tutino, *R. Vásquez, D. Ampam, E. Quiaco, A. Ampam & C. Dupis 21407* (MO). **Loreto:** near Base Araguana, upper Río Mazán ca. due N of Santa María de Nanay, *A. Gentry & J. Revilla 16511* (MO). **San Martín:** Rioja, *F. Woytkowski 6095* (MO).

Psychotria puyoana C. M. Taylor, sp. nov. TYPE: Ecuador. Pastaza: E edge of Puyo, 25 Sep. 1971, *J. Hudson 819* (holotype, MO-5873156; isotype, MO-5873157). Figure 4D–F.

Haec species a congeneris aequatorialibus foliis subsessilibus oblanceolatis obovatisve basi rotundatis cordulatisve, inflorescentiae axibus secundariis ad nodos quattuor in paria inaequalia dispositis atque floribus ebracteatis sed pubescentia pilosula hirtellave subtentis distinguitur.

Shrub to 2 m tall; stems densely puberulous to tomentellous. *Leaves* oblanceolate to obovate, 15–23 × 5.5–11 cm, at apex acute to acuminate, at base rounded to cordulate, drying papyraceous, adaxially glabrous, abaxially glabrous on lamina and densely puberulous to strigillose on veins; secondary veins 13 to 18 pairs, looping to interconnect, in abaxial axils without domatia, adaxially venation plane, abaxially costa prominent, secondary veins prominulous, and remaining venation plane to thickened; margins plane, entire; *petioles* 0–3 mm long; *stipules* interpetiolar,

caducous, ovate, ca. 18 mm long, glabrous, obtuse, weakly 2-costate near base. *Inflorescences* terminal, paniculate, densely puberulous to strigillose; peduncle 2–4 cm long; branched portion pyramidal, 4–10 × 4–7 cm, secondary axes 4 per node in unequal pairs; bracts subtending secondary axes triangular to broadly triangular, 1–2 mm long. *Flowers* sessile in glomerules of 3 to 7, each subtended by a ring or tuft of pilosulous or hirtellous pubescence; hypanthium turbinate, ca. 0.8 mm long, glabrous; *calyx limb* ca. 1 mm long, glabrous, subtruncate; *corolla* tubular, cream to white, externally glabrous, internally densely pilosulous at stamen insertion, tube 2–2.5 mm long, lobes 2.5–3 mm long, abaxially smooth or with a small thickening on upper middle portion; anthers 1.2–1.5 mm long, in short-styled form well exserted, in long-styled form partially exserted; stigmas in long-styled form ca. 0.8 mm long and partially exserted, in short-styled form ca. 1 mm long and included. *Infructescences* similar to inflorescences. *Fruits* ellipsoid, ca. 6 × 5 mm, glabrous, red; pyrenes 2, dorsally with 4 to 5 low rounded to flattened ridges, ventrally plane.

Habitat, distribution, and phenology. In wet forest at 900–1200 m, known only from eastern Ecuador; collected in flower in January, March, September, and November, in fruit in September.

This new species can be recognized by the combination of its subsessile, oblanceolate to obovate leaves that are rounded to cordulate at the base, its secondary inflorescence axes that are borne 4 per node in unequal pairs, its short petioles, 2–6 mm long, and its flowers that are subtended by pilosulous or hirtellous pubescence but ebracteate. This species appears to at least sometimes have a "trash bucket" habit, with the subsessile to sessile leaves accumulating detritus around stem at their bases (e.g., *Asplund 19593*). The epithet refers to the type locality, near Puyo, Ecuador. The flowers appear to be distylous but with the stigmas and anthers of the long-styled form situated at the same height (e.g., *Palacios 3799*), an unusual arrangement that may be an artifact of drying. This new species is similar to *Psychotria romolerouxiana* of Amazonian Ecuador and Peru; *P. romolerouxiana* can be separated by its leaves that are acute to obtuse at the base and abaxially have well-developed foveolate domatia in the vein axils, its shorter bilobed stipules, 6–14 mm long, and its shorter calyx limb, ca. 0.5 mm long.

Paratypes. ECUADOR. **Morona-Santiago:** N of Macas, *E. Asplund 19758* (S). **Napo:** vía Hollín–Loreto, a 3 km después del Río Hollín, 00°52′S, 77°43′W, *W. Palacios 3799* (MO). **Pastaza:** Mera, near Mangayacu, *E. Asplund 19593* (S); Río Puyo near village of Puyo, *F. Fagerlind & G. Wibom 1226* (S).

Psychotria ucumariana C. M. Taylor, sp. nov. TYPE: Colombia. Risaralda: mpio. Pereira, Parque Regional Ucumarí, Cordillera Central, 4°45′N, 75°35′W, 1600 m, 5–7 Aug. 1995, *C. Múrcia 400* (holotype, MO-5059711). Figure 1A–D.

Haec species a congeneris colombianis floribus in glomerulos capitulave subglobosa hemisphaericave dispositis, limbo calycino sat (ca. 1.5 mm) longo atque stipulis ovatis usque ellipticis 10–18 mm longis distinguitur; etiam sylvas premontanas montanasque habitat.

Shrub or small tree to 4 m tall; stems densely puberulous. *Leaves* elliptic to obovate, 15–35.5 × 6.5–15 cm, at apex acute to shortly acuminate, at base cuneate to acute, drying papyraceous, adaxially glabrous, abaxially glabrous to puberulous on lamina and densely puberulous to hirtellous on costa and secondary veins; secondary veins 12 to 22 pairs, looping to interconnect, in abaxial axils without domatia or sometimes with dense tufts of short trichomes, adaxially venation plane, abaxially costa prominent, secondary veins prominulous, and tertiary venation plane to thickened; margins plane, entire; *petioles* 1–2 cm long; *stipules* interpetiolar although apparently overlapping on sides, caducous, ovate to elliptic, 10–18 mm long, densely puberulous to hirtellous, obtuse to rounded or shallowly emarginate, entire. *Inflorescences* terminal often becoming displaced to a pseudoaxillary position by subsequent stem growth, paniculate, densely hirtellous; peduncle 7–10.5 cm long; branched portion pyramidal, 7–9 × 7–13 cm, secondary axes paired or rarely 4 with one pair markedly shorter (to 2 cm long) and strongly reflexed, secondary and tertiary axes spreading at 90° or more, terminating in globose to hemispherical glomerules or capitula; bracts ovate to broadly triangular, 2–3 mm long. *Flowers* distylous, sessile; hypanthium cupuliform, ca. 1 mm long, densely tomentellous or puberulous; *calyx limb* ca. 1.5 mm long, densely hirtellous or pilosulous to puberulous, dentate; *corolla* funnelform, white, externally strigillose to glabrescent, internally densely pilosulous at stamen insertion, tube ca. 2.5 mm long, lobes 5, ca. 2 mm long, abaxially with a rounded projection 0.3–0.5 mm long on upper middle portion; anthers in long-styled form ca. 1 mm long and partially to fully exserted, in short-styled form ca. 1.1 mm long and well exserted; stigmas in long-styled form ca. 0.5 mm long and well exserted on styles ca. 4 mm long, in short-styled form ca. 1.5 mm long and included, situated in upper part of corolla tube. *Infructescences* similar to inflorescences. *Fruits* ellipsoid, ca. 6 × 4 mm, glabrescent, color not noted; pyrenes 2, dorsally with 4 to 5 low rounded ridges, ventrally plane.

Habitat, distribution, and phenology. Wet premontane and montane forest at 1600–2300 m, western Colombia to northern Ecuador; collected in flower in February, August, and November, in fruit in April and August.

This new species is distinguished by its combination of inflorescences with the flowers in subglobose to hemispherical glomerules or heads, relatively long calyx limbs, ca. 1.5 mm long, ovate to elliptic stipules 10–18 mm long, and a habitat in premontane and montane forests. This new species is similar in aspect to *Psychotria rimbachii*, but that latter species has the secondary inflorescence axes usually borne 4 per node and ascending, whereas this new species has secondary inflorescence axes that are paired and spreading to usually reflexed or sometimes reflexed at base then curving back and ascending. *Psychotria rimbachii* is also sometimes found at lower elevations (800–2000 m) than this new species.

Paratypes. COLOMBIA. **Caldas:** Manizales, Monteleón, Cordillera Central, *M. de Fraume*, [no initial] *Alvarez* & [no initial] *Gallejo 426* (FAUC, MO); Termales el Otoño, [no initial] *Orozco*, [no initial] *Vargas* & [no initial] *Serrano 8* (FAUC, MO). **Norte de Santander:** Chitagá, E of Río Valegrá, S of Quebrada Valegrá, Con. [sic] Chucarima, Cordillera Oriental, *F. R. Fosberg 19125* (NY). **Risaralda:** Pereira, Parque Regional Ucumarí, Cordillera Central, 4°45′N, 75°35′W, *C. Múrcia 445* (MO), *C. C. Múrcia & MK 595* (MO). **Valle del Cauca:** El Silencio, Hacienda Himalaya, W of Yumbo, Cordillera Occidental, 3°38′N, 76°33′W, *A. Gentry, R. Ruiz, S. Sarria & C. Galvis 65388* (MO). ECUADOR. **Carchi:** valle de Maldonado, Km 71 on road Tulcán–Maldonado, 00°51′N, 78°06′W, *L. Holm-Nielsen, S. Jeppesen, B. Løjtnant & B. Øllgaard 5981* (AAU).

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Literature Cited

Andersson, L. 2001. *Margaritopsis* (Rubiaceae, Psychotrieae) is a pantropical genus. Syst. Geogr. Pl. 71: 73–85.

———. 2002. Relationships and generic circumscriptions in the *Psychotria* complex (Rubiaceae, Psychotrieae). Syst. Geogr. Pl. 72: 167–202.

——— & J. H. E. Rova. 1999. The *rps*16 intron and the phylogeny of the Rubioideae (Rubiaceae). Pl. Syst. Evol. 214: 161–186.

Hamilton, C. W. 1989. A revision of Mesoamerican *Psychotria* subg. *Psychotria* (Rubiaceae). Ann. Missouri Bot. Gard. 76: 67–111, 386–429, 886–916.

Nepokroeff, M., B. Bremer & K. J. Sytsma. 1999. Reorganization of the genus *Psychotria* and tribe Psychotrieae (Rubiaceae) inferred from ITS and *rbc*L sequence data. Syst. Bot. 24: 5–17.

Petit, E. 1964. Les espèces africaines du genre *Psychotria* L. (Rubiaceae)—I. Bull. Jard. Bot. État. Bruxelles 34: 1–228.

Piesschaert, F. 2001. Carpology and Pollen Morphology of the Psychotrieae (Rubiaceae–Rubioideae), towards a New Tribal and Generic Delimitation. Dissertation, Catholic University of Leuven, Belgium.

Taylor, C. M. 1996. Overview of the Psychotrieae (Rubiaceae) in the Neotropics. Opera Bot. Belg. 7: 261–270.

———. 1997. Rubiaceae. *In:* R. Vásquez M., Flórula de las Reservas Biológicas de Iquitos, Perú. Monogr. Syst. Bot. Missouri Bot. Gard. 63: 602–637.

———. 2002. Rubiacearum americanarum magna hama pars VI: New species of and morphological notes on *Psychotria* subg. *Psychotria* (Psychotrieae) from Mesoamerica and western South America. Novon 12: 120–132.

A New Species of *Eleocharis* R. Brown (Cyperaceae) from Southern Brazil

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Abstract. *Eleocharis laeviglumis* is a new species from the Brazilian flora. This species belongs to *Eleocharis* subg. *Limnochloa* (P. Beauvois ex T. Lestiboudois) Torrey and is very similar to *Eleocharis elongata* Chapman. The new species differs from all species of *Eleocharis* R. Brown by culms terete, not septate; lower scale fertile; upper scales cartilaginous, smooth, without prominent veins, with submarginal band vinaceous to brown, hyaline margin conspicuous and abruptly differentiated from the rest of scale; slender bristles; achenes trigonous, reticulate, and without a short neck on the apex. Morphological description, illustration, data on habitat, and comparison with the similar species are presented.

Resumo. *Eleocharis laeviglumis* é uma nova espécie descrita para a flora brasileira. Esta espécie pertence a *Eleocharis* subg. *Limnochloa* (P. Beauvois ex T. Lestiboudois) Torrey e é muito semelhante a *Eleocharis elongata* Chapman. A nova espécie diferencia-se das outras espécies do gênero *Eleocharis* pelos colmos cilíndricos, não septados; gluma inferior fértil; glumas superiores cartilaginosas, lisas, de nervuras inconspícuas, com uma faixa submarginal vinácea a castanha, margem hialina desenvolvida e nitidamente delimitada do restante da gluma; cerdas hipóginas tenues; aquênios trígonos, reticulados, e sem colo no ápice. Apresenta-se a descrição morfológica, ilustração, dados sobre o habitat, e uma comparação com a espécie similar.

Key words: Brazil, Cyperaceae, *Eleocharis*, *Limnochloa*.

Eleocharis is a worldwide genus that includes ca. 200 species (González-Elizondo & Tena-Flores, 2000) with a remarkable richness in tropical and subtropical America (Goetghebeur, 1998). Distinctive features, such as unbranched aerial culms, leaves reduced to tubular sheaths, inflorescence constituted of one spikelet on the apex of culms without involucral bracts, and style-base enlarged and persistent on the achene, are uniformly found in this genus.

Almost all species of *Eleocharis* are restricted to wetlands, often in muddy soils that are temporarily wet or inundated.

There are some taxonomic treatments of *Eleocharis*, such as Svenson (1929, 1932, 1934, 1937, 1939), Barros (1947, 1960), González-Elizondo (1994), González-Elizondo and Reznicek (1998), and Smith et al. (2005), based on a regional or a worldwide review of the species.

The supraspecific classifications of *Eleocharis* (Svenson, 1939; Kukkonen, 1990; González-Elizondo & Peterson, 1997) are based on morphological data. A study using DNA sequences (Roalson & Friar, 2000) verified that some groups proposed in recent classifications are probably monophyletic.

Eleocharis laeviglumis Trevisan & Boldrini, sp. nov. TYPE: Brazil. Rio Grande do Sul: mun. Santa Vitória do Palmar, BR 471, 32 45′00.1″S, 52 38′51.4″W, 26 Nov. 2004, *I. Boldrini, E. N. Garcia & R. Trevisan 1311* (holotype, ICN; isotype, K, MO). Figure 1.

Eleocharis laeviglumis Trevisan & Boldrini ab omnibus speciebus generis culmis teretibus, non septatis, squama inferna fertili, squamis superis cartilagineis, laevibus, nervis inconspicuis, fasciis submarginalibus vinaceis vel brunneis, marginibus hialinis conspicuis distincte a parte inferna squamis, setis hypogynis tenuibus, acheniis trigonis, reticulatis sin collis in apicibus differt.

Perennial, erect from creeping and ligneous rootstock, often with elongate rhizomes 1.5–2.5 mm wide, with internodes 1.2–2.2(–3) cm long, scales 5–

Figure 1. *Eleocharis laeviglumis* Trevisan & Boldrini. —A. Habit. —B. Spikelet. —C. Upper scale, dorsal view. —D. Achene. —E. Achene, cross section. —F. Culm, cross section. —G. Sheath, dorsal view of the apex. B, C, and F drawn from *R. Trevisan & L. Boldrini 32* (ICN); D and E from *R. Trevisan et al. 324* (ICN); and A and G from *R. Trevisan et al. 329* (ICN).

6 mm long; *culms* 30–65 × 0.1–0.3 cm, terete, nonseptate, generally nodulate, internally spongy; *sheaths* 7–15 cm long, apex oblique acuminate. *Spikelets* 10–23 × 2.2–3.5 mm, lanceoloid to cylindric, as wide as their culms, 20- to 50-flowered, not proliferous, stramineous to yellowish brown; *lower scale* fertile, coriaceous, ovate, apex obtuse, green, with conspicuous hyaline margin; *upper scales* 3.5–4(–5) × 2–

2.3 mm, cartilaginous, strongly imbricate, elliptic to obovate, apex obtuse, spiralate, appressed, not keeled, stramineous to yellowish brown, inconspicuous nerved, smooth, with submarginal band vinaceous to brown, hyaline margin conspicuous and abruptly differentiated from the rest of scale; *bristles* 6 or 7, white to yellowish white, slender, somewhat denticulate, equaling or exceeding the achene including the style-base; *stamens* 3, anthers 1.3–1.5 mm long; *style* trifid. *Achenes* 1.2–1.5 × 0.8–1 mm, trigonous, obovoid to obpyriform, reticulate with 8 to 10 rows of coarse transversely linear cells on the adaxial face, light green to stramineous; *style-base* 0.6–0.8 mm long, not confluent but separated from the achene by a small constriction, pyramidally elongate, usually curvate, green to brownish green.

Etymology. The epithet refers to the smooth scales. This character is not common in *Eleocharis* subg. *Limnochloa*.

Habitat and distribution. The species is very common in permanently flooded environments in coastland regions in Rio Grande do Sul and Santa Catarina, Brazil. The plants generally have culms partially submerged, forming clonal masses. Developed rootstocks are not present in young individuals. This structure was observed only in old plants.

According to the supraspecific classification proposed by González-Elizondo and Peterson (1997), *Eleocharis laeviglumis* belongs to *Eleocharis* subg. *Limnochloa* (P. Beauvois ex T. Lestiboudois) Torrey sect. *Limnochloa* (P. Beauvois ex T. Lestiboudois) Bentham & Hooker f. The new species is included in this subgenus on the basis of the following features: lower scale is fertile and appears to be a continuation of the fertile culm; upper spikelet scales are indurate, are not keeled, and have a distinct hyaline margin; ornamentation on the achenes appears as polygonal cells.

Eleocharis elongata Chapman is very similar to the new species, but differs by slender (0.4–1.5 mm) and flaccid culms, striate and loosely imbricate upper scales, achene apex constricted to short neck, and style-base 0.2–0.5 mm long.

Paratypes. BRAZIL. **Rio Grande do Sul:** Osório, estrada do Mar, 29°54′20″S, 50°14′44″W, 28 Jan. 2004, *R. Trevisan, H. M. Longhi-Wagner & S. Hefler 318* (ICN); Osório, estrada do Mar, km 20, 29°51′35″S, 50°04′57″W, 28 Jan. 2004, *R. Trevisan, H. M. Longhi-Wagner & S. Hefler 324* (ICN); Viamão, Itapuã, Apr. 1984, *M. Sobral 2949* (ICN); Xangri-lá, estrada do Mar, km 22, 16 Oct. 2003, *R. Trevisan & I. Boldrini 32* (ICN); Xangri-lá, estrada do Mar, km 26, 29°48′44″S, 50°03′42″W, 28 Jan. 2004, *R. Trevisan, H. M. Longhi-Wagner & S. Hefler 329* (ICN). **Santa Catarina:** Palhoça, Massiambú, 20 Dec. 1952, *R. Reitz 5011* (HBR, PACA).

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Literature Cited

Barros, M. 1947. Cyperaceae. Pp. 1–243 *in* H. Descole, Genera et Species Plantarum Argentinarum, Tomo 4, parte 1.

———. 1960. Las Ciperáceas del Estado de Santa Catalina. Sellowia 12: 181–448.

Goetghebeur, P. 1998. Cyperaceae. Pp. 141–190 *in* K. Kubitzki, H. Huber, P. J. Rudall, P. S. Stevens & T. Stützel (editors). The Families and Genera of Vascular Plants, IV: Flowering Plants—Monocotyledons. Springer-Verlag, Berlin.

González-Elizondo, M. S. 1994. *Eleocharis* R. Br. (Cyperaceae). Pp. 458–464 *in* G. Davidse, M. Souza & A. O. Chater (editors), Flora Mesoamericana, Vol. 6. Alismataceae a Cyperaceae. Universidad Nacional Autónoma de Mexico, México, D.F.; Missouri Botanical Garden, St. Louis; The Natural History Museum, London.

——— & P. M. Peterson. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). Taxon 46: 433–449.

——— & A. A. Reznicek. 1998. *Eleocharis* R. Br. Pp. 518–561 *in* P. E. Berry, B. K. Holst & K. Yatskievych (editors), Flora of the Venezuelan Guayana, Vol. 4. Caesalpiniaceae–Ericaceae. Missouri Botanical Garden Press, St. Louis.

——— & J. A. Tena-Flores. 2000. *Eleocharis* (Cyperaceae) in the New World. Pp. 637–643 *in* K. L. Wilson & D. A. Morrison (editors), Monocots: Systematics and Evolution. CSIRO Publishing, Melbourne.

Kukkonen, I. 1990. On the genus *Eleocharis* (Cyperaceae) in Flora Iranica area, with revised infrageneric classification and nomenclature. Ann. Bot. Fenn. 27: 109–117.

Roalson, E. H. & E. A. Friar. 2000. Infrageneric classification of *Eleocharis* (Cyperaceae) revisited: Evidence from the Internal Transcribed Spacer (ITS) region of nuclear ribosomal DNA. Syst. Bot. 25: 323–336.

Smith, S. G., J. J. Bruhl, M. S. González-Elizondo & F. J. Menapace. 2002. *Eleocharis* R. Brown *in* P. W. Ball, A. A. Reznicek & D. F. Murray, Flora of North America North of Mexico, Vol. 23. Magnoliophyta: Commelinidae: Cyperaceae. Oxford University Press, New York. Available at: <http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=111420>. Accessed 8 July 2005.

Svenson, H. K. 1929. Monographic Studies in the Genus *Eleocharis* I. Rhodora 31: 121–135, 152–163, 167–191, 199–219, 224–242.

———. 1932. Monographic Studies in the Genus *Eleocharis* II. Rhodora 34: 193–203, 215–227.

———. 1934. Monographic Studies in the Genus *Eleocharis* III. Rhodora 36: 377–389.

———. 1937. Monographic Studies in the Genus *Eleocharis* IV. Rhodora 39: 210–231, 236–273.

———. 1939. Monographic Studies in the Genus *Eleocharis* V. Rhodora 41: 1–19, 43–77, 90–110.

A New Species of the Genus *Rhamnus* (Rhamnaceae) from China

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ABSTRACT. *Rhamnus mongolica* Y. Z. Zhao & L. Q. Zhao (Rhamnaceae) is described from Inner Mongolia, China. The new species is related to *R. gilgiana* Heppeler, but distinguished by its leaves oblanceolate or obovate-lanceolate and glabrous on both surfaces.

Key words: China, Inner Mongolia, Rhamnaceae, *Rhamnus*.

The genus *Rhamnus* L. contains approximately 200 species, about 57 of which are found in China. Of these, 10 species are found in Inner Mongolia.

The cited specimens in this paper had previously been confirmed as *Rhamnus erythroxylon* Pallas, *R. parvifolia* Bunge, *R. ussuriensis* J. J. Vassiljev, and *R. tumetica* Grubov; furthermore, their distributions have been cited in *Flora of Inner Mongolia*, 2nd edition (Ma, 1989). In the course of additional study of the genus *Rhamnus* in Inner Mongolia, we found that these specimens were previously misidentified and now describe them as a new species.

Rhamnus mongolica Y. Z. Zhao & L. Q. Zhao, sp. nov. TYPE: China. Inner Mongolia: XilinGol Meng, Baiyinxile, 24 July 1959, *Inner Mongolia Univ. Stepp. Exped. 185* (holotype, HIMC).

Haec species *R. gilianae* Heppeler affinis, sed foliis oblanceolatis vel obovati-lanceolatis, utrinque glabris differt.

Frutex, 1–2 m tall. Branchlet patulous, opposite, rarely approximate opposite or alternate, dark brown, spinescent at apex. Leaves papyraceous, opposite, tufted at brachyblast, oblanceolate or obovate-lanceolate, 1–3 cm long, 5–10 mm wide, argute or obtuse at apex, cuneate at base, crenulate at margins, lateral nerves 3 to 4 pairs, above green, below light green, glabrous on both surfaces; petiole 2–7 mm long, glabrous. Flowers imperfect, tetramerous, yellow-green; staminate flowers 3–4 mm long, 20 to 30 tufted at leaf axils of brachyblast, sepals 4, ovate-triangular, 2–2.5 mm long, argute at apex; petals 4, oblong, ca. 1 mm long, pedicels 2–4 mm long, glabrous; pistillate flowers not seen. Drupes spheroidal, ca. 4 mm diam., with cotyliform persistent calyx at base, 2 putamens; carpopodium 4–6 mm long, glabrous; seeds elliptic, dark brown, with a vertical sulcus at back as long as 4/5 of the seed.

Habitat and distribution. Rhamnus mongolica occurs in valleys in the Xilinhaote, Duolun, Keyouqianqi, Daqing Mountain, and Manhan Mountain regions of Inner Mongolia.

Phenology. Flowering in June; fruiting from July to August.

Paratypes. CHINA. **Inner Mongolia:** Duolun, 31 May 1959, *Inner Mongolia Univ. 98* (HIMC); Keyouqianqi, 22 Aug. 1982, *Medic. Exped. s.n.* (HIMC); Mt. Daqing, 1 June 1982, *Shi Quan Zhou et al. 820615* (NMAC); Mt. Manhan, 12 July 2002, *Yi-Zhi Zhao 3102* (HIMC).

The chief morphological differences between the new species and five similar species with which it may be confused are summarized in the following key. The six species of *Rhamnus* also have the following characters in common: small yellow-green imperfect flowers, dioecism, epigynous ovary, and spheroidal drupe.

KEY TO DISTINGUISH *RHAMNUS MONGOLICA* FROM SIMILAR SPECIES

1a. Leaf and branchlet alternate, rarely approximate opposite; leaf linear or linear-lanceolate . . . . . 1. *R. erythroxylon* Pallas

1b. Leaf and branchlet opposite or approximate opposite, rarely alternate.

2a. Sulcus at back of seed closed; leaf elliptic-obovate, 3–13 cm long . . . . . 2. *R. ussuriensis* J. J. Vassiljev

2b. Sulcus at back of seed open, as long as 1/5 of the seed; leaf 0.5–4 cm.

3a. The back of leaf with tufted villi in the axils of nerves; leaf rhombic-obovate or rhombic-elliptic, 1.2–4 cm long . . . . . 3. *R. parvifolia* Bunge

3b. The back of leaf without tufted villi in the axils of nerves.

4a. Leaf small, ovate-rotund, obtuse at apex, not more than 1 cm long; plant short and small; branches coarctate . . . . . 4. *R. tumetica* Grubov

4b. Leaf large, usually more than 1 cm long, acute at apex; plant tall; branches lax.

5a. Leaf elliptic or lanceolate, pubescent on both surfaces . . . . . 5. *R. gilgiana* Heppeler

5b. Leaf oblanceolate or obovate-lanceolate, glabrous on both surfaces . . . . . 6. *R. mongolica* Y. Z. Zhao & L. Q. Zhao

Literature Cited

Ma En-wei. 1985. Flora Intramongolica, 2nd ed. Typis Intramongolicae Popularis Hohhot 3: 180–193.

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Solanum perlongistylum and *S. catilliflorum*, New Endemic Peruvian Species of *Solanum*, Section *Basarthrum*, Are Close Relatives of the Domesticated Pepino, *S. muricatum*

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Abstract. Two species new to *Solanum* sect. *Basarthrum* (Bitter) Bitter are described. *Solanum perlongistylum* G. J. Anderson, Martine, Prohens & Nuez and *S. catilliflorum* G. J. Anderson, Martine, Prohens & Nuez are narrowly distributed species from southern Peru in the group that includes the Andean domesticate *S. muricatum* Aiton and are very closely related to the widespread *S. caripense* Dunal. *Solanum catilliflorum* bears small, dish-shaped flowers (for which it is named) and is self-compatible and autogamous, with short styles like those that characterize all self-compatible species in this section. It also has a low pollen:ovule ratio, which is characteristic of self-compatible species in the group. On the other hand, the style of the self-incompatible *S. perlongistylum* is the longest in the group, and its flowers have a higher pollen:ovule ratio. Both species are diploid at $n = 12$. We hypothesize that these two species may be peripheral isolates from the widespread and variable *S. caripense*.

Key words: IUCN Conservation Status: VU, pepino, pollen:ovule ratios, Solanaceae, *Solanum catilliflorum*, *Solanum perlongistylum*, *Solanum* sect. *Basarthrum*.

Some of the species in *Solanum* L. sect. *Basarthrum* (Bitter) Bitter are highly variable, a feature noted in a number of current biosystematic studies (e.g., Anderson, 1979a; Anderson & Jansen, 1998), as well as by the original monographer of the group, Donovan Correll (1962). In particular, the domesticated pepino, *Solanum muricatum* Aiton, displays great morphological diversity (e.g., Anderson et al., 1996; Anderson & Jansen, 1998; Prohens et al., 1996). This is not surprising, given the variability of many domesticates. However, some of the wild species in the section also show wide variation. Common garden (usually northern temperate greenhouse) studies have been useful in understanding some of that variation. For instance, growing plants from seeds to flowering has allowed the recognition of leaf variation (from 1- to 11-foliate) that characterizes developmental stages rather than distinguishes among species (Anderson et al., 1999). The results from interspecific hybridization studies revealed that anther, pistil, and pollen differences among three types of plants formerly recognized as distinct species actually characterized the sexes of a single dioecious species, *S. appendiculatum* Dunal (Anderson, 1979b; Anderson & Levine, 1982).

The variation within the series *Caripensia* Correll has been of special interest; there are a number of species in this group, and many are difficult to distinguish morphologically. Thus, the variation within any particular species can be great. However, some of that variation is not intraspecific, but rather interspecific. Thus, intensive studies of a broad range of data have led to the recognition of a number of new species (e.g., *Solanum cochoae* G. J. Anderson & Bernadello (Anderson & Bernadello, 1991) and *S. heiseri* G. J. Anderson (Anderson, 1975)). *Solanum caripense* Dunal is one of the most widespread wild species (distributed in mountainous regions from Costa Rica to Peru) and may be the plexus from which more local variants have become separated and isolated. Extensive studies of morphology, chromosomes, crossability, and lately, DNA have supported various elements as distinct entities, for example, *S. heiseri* and *S. cochoae* (Anderson & Jansen, 1998; Prohens et al., 2003). Most recently, a field expedition (Fernando Nuez, Jaime Prohens, and associates) identified populations from southern Peru that are morphologically clearly in the series *Caripensia* (*S. basendopogon* Bitter, *S. caripense*, *S. cochoae*, *S. filiforme* Pavón ex Dunal, *S. fraxinifolium* Dunal, *S. heiseri*, *S. trachycarpum* Bitter & Sodiro). However, DNA extractions from these presumed *S. caripense* variants were also part of a study of amplified length polymorphisms (AFLP) in section *Basarthrum* (Prohens et al., 2006). *Solanum perlongistylum* and *S. catilliflorum* proved to possess AFLP patterns more distinct from the plexus of the series *Caripensia* than any of the other species; in fact, the AFLP patterns of these new Peruvian populations are more distinct than most recognized species in section *Basarthrum*. Further study has confirmed that these elements merit recognition as distinct species, and they are so described below, along with additional data that provide some perspective on their biology and systematic position.

The bulk of the measurements for both species were made from a large number of living plants grown from seed collected in Peru in March 2001. Because the original field collections of Prohens and Nuez consisted only of seeds, the type material and herbarium specimens are from plants grown from those seeds and cultivated in the University of Connecticut Ecology and Evolutionary Biology Conservatory.

Solanum perlongistylum G. J. Anderson, Martine, Prohens & Nuez, sp. nov. TYPE: U.S.A. Connecticut: cultivated at Univ. Conn. Ecol. & Evol. Biol. Conservatory, Storrs, 19 Nov. 2004, *C. T. Martine 953* (holotype, CONN; isotypes, MO, MOL, NY, US, VAL) [Peru. Huancavelica: near Montacra, quebrada border, 16 Mar. 2001, seed collection, *J. Prohens & F. Nuez 51*]. Figure 1A–D.

Habitus semierectus; foliola base rotunda, plerumque tria; pubescentia densa, pili longi; sine pugiotis pilis glandulosis; stylus perlongus, extendens multo ultra columnam staminalem.

Trailing or viny shrub with arching-ascending branches to 1 m long or more, internodes 20–70 mm; stem woody or thick-herbaceous, moderately strigose when young, the older branches occasionally rooting at nodes. Leaves with mostly 3 (rarely 1 or 5) leaflets, 40–60 mm long, with petiole 10–20 mm long; leaflets lanceolate to lanceolate-elliptic, base obtuse, apex acute or acuminate, not glutinous, with moderately dense strigose vestiture of 2-celled bayonet hairs (ca. 0.8 mm) intermixed with short square gland hairs (ca. 0.08 mm) on both surfaces; gland-tipped finger hairs not present; terminal leaflet somewhat larger than the first pair of lateral leaflets, 27–44 × 14–24 mm, petiolule 3–7 mm long; first pair of lateral leaflets 9–20 × 6–14 mm, short-petiolulate; pseudostipules present. Inflorescence an indeterminate pseudoterminal cymose raceme with 1 axis and (5)6 to 8(13) hermaphrodite flowers; pedicels 8–13 mm long, basally articulate, with dense strigose vestiture of 2-celled bayonet hairs intermixed with short square gland hairs. Corolla white or purple and fading to white, rotate, moderately reflexed, the lobes 11–14 mm long, the sinuses 9–11 mm long, the lobe:sinus ratio about 1.4:1, glabrous or sparingly strigose adaxially, densely puberulent abaxially; calyx green, acute to acuminate, about 1/2 the length of the corolla lobes (6–7 mm long), the strigose vestiture heavy; anthers pale yellow, the apices rounded, 3.5–4.8 mm long, glabrous adaxially and abaxially, filaments 0.7–1.3 mm long, fused for less than 1/4 of their length, with scattered stiff hairs around base; style 7.3–12.8 mm long, sparingly to densely strigose over lower 2/3 of length, the stigma slightly capitate, exceeding staminal column by 3.6–4.4 mm. Fruits globose, mature fruits pale green or yellowish green with darker green or purple-black stripes, with darker maculae on the lighter areas, 22–27 × 23–27 mm, round in cross section, smooth, apex rounded, locules 2; soluble solids concentration 6.0%–7.5%; seeds 60 to 120 per fruit; fruits falling from plant when ripe. Pollen grains per anther ca. 133,765, pollen:ovule ratio ca. 4968:1 (Table 1); plants self-incompatible; $n = 12$ (*Martine 953*, CONN).

Habitat and distribution. Collections of the species have been made in Peru at elevations around

Figure 1. Photographs of *Solanum perlongistylum* (A–D) and *S. catilliflorum* (E–H). —A. Flowers. —B. Form. —C. Fruits. —D. Field habit. —E. Flowers. —F. Form. —G. Fruits. —H. Field habit. Scale as indicated, except for the fruits (C & G), where each square is 10 × 10 mm.

Table 1. Pollen:ovule ratios of *Solanum perlongistylum* and *S. catilliflorum*. Pollen:ovule ratios of the two species are significantly different; see text. GJA = G. J. Anderson numbers used to label greenhouse-grown plants from seeds of original field collections by Prohens and Nuez. PN = Prohens and Nuez original seed collection numbers. * Mean pollen:ovule ratio for all accessions of *S. perlongistylum* = 1968 ± 1719. ** Mean pollen:ovule ratio for all accessions of *S. catilliflorum* = 2170 ± 365.

*S. perlongistylum**			*S. catilliflorum***		
Accessions	Pollen grains per flower (5 anthers)	Ovules per flower	Accessions	Pollen grains per flower (5 anthers)	Ovules per flower
GJA 4561 (PN 51)	664,300	154	GJA 4565 (PN 71)	222,100	85
GJA 4561 (PN 51)	638,600	184	GJA 4565 (PN 71)	198,300	
GJA 4561 (PN 51)		172	GJA 4566 (PN 74)	183,800	88
GJA 4562 (PN 61)	862,000	120	GJA 4566 (PN 74)	185,000	70
GJA 4562 (PN 61)	805,000		GJA 4567 (PN 80)	172,100	124
GJA 4564 (PN 64)	497,800	117	GJA 4567 (PN 80)	186,100	94
GJA 4564 (PN 64)	545,000	117	GJA 4568 (PN 82)	217,100	116
GJA 4564 (PN 64)		145	GJA 4568 (PN 82)	227,500	67

2100–3200 m on field borders, road cuts, quebradas, and riverbanks. Local names for *Solanum perlongistylum* vary, as do perceptions of the edibility of the fruits. Near Montacra in Huancavelica, the fruit is known as nokai and is said to be poisonous to livestock. Locals in the area of Ocros in Ayacucho call the species alpunto and also consider the fruits inedible. However, around Ccochahuaylo, Apurimac, people consider the fruits edible and sweet, and call the species pepino de monte (Prohens, pers. obs.).

The new taxon is distinguished from morphologically similar species in *Solanum* sect. *Basarthrum* ser. *Caripensia* by bearing the longest styles, nearly 8.5 mm on average, versus about 6 mm for the other species with which it might be confused (i.e., the so-called Caripense complex including the widespread *S. caripense* (Central America to Peru) and the narrowly distributed *S. filiforme* (only in Peru), *S. fraxinifolium* (mostly in Venezuela), and *S. heiseri* (only in Colombia) (Anderson & Bernardello, 1991; Prohens et al., 2006)). Furthermore, the style of this new species extends beyond the staminal column by an average of about 4 mm, almost twice as much as the similar species in the Caripense complex. The flowers are generally larger as well (11–14 mm vs. ca. 8.0–8.5 mm in *S. caripense*). The anthers are lemon yellow in *S. perlongistylum*, versus the more orange-yellow of closely related species. The leaf hairs are long, yielding a white-downy appearance to the leaves. The hairs are about 40% longer than those of *S. catilliflorum*. Both of these new species bear two types of hairs: 2-celled bayonet hairs and short square gland hairs. All other species in the series have these plus a third type: gland-tipped finger hairs (these being the cause for viscid leaves in the other species). There are generally 3 leaflets, although that is not particularly distinctive, and the habit is a bit more upright, similar to (but not as upright as) *S. basendopogon*.

Etymology. The epithet was selected to reflect the notably long styles.

Conservation status. Estimated IUCN rank: VU. Rare and known from a limited number of localities. Total wild population still unknown.

Paratypes. U.S.A. **Connecticut:** cultivated at Univ. Conn. Ecol. & Evol. Biol. Conservatory, Storrs, 18 July 2005, *C. T. Martine & M. R. Opel 1083* (CONN) [Peru, Apurimac, Ccochahuaylo, 18 Mar. 2001, seed collection, *J. Prohens & F. Nuez 62*], 18 July 2005, *C. T. Martine & M. R. Opel 1082* (CONN) [Peru, near Apurimac River, Ninabamba, 17 Mar. 2001, seed collection, *J. Prohens & F. Nuez 61*].

Solanum catilliflorum G. J. Anderson, Martine, Prohens & Nuez, sp. nov. TYPE: U.S.A. Connecticut: cultivated at Univ. Conn. Ecol. & Evol. Biol. Conservatory, Storrs, 19 Nov. 2004, *C. T. Martine 949* (holotype, CONN; isotypes, MO, MOL, NY, US, VAL) [Peru, Abancay: near Abancay, rubbish heap in wet terrain, 19 Mar. 2001, seed collection, *J. Prohens & F. Nuez 80*]. Figure 1E–H.

Habitus reptans; folia et foliola parva; folia in foliola pleraque 3 divisa; sine pugiotis pilis glandulosis; flores parvuli; stylus brevis, extendens vix ultra columnam staminalem; fertile secum; fructus parvi.

Viney or trailing shrub; branches to 1 m long; internodes 15–60 mm; stem woody or thick-herbaceous, moderately strigose when young, older branches commonly rooting at nodes. Leaves with mostly 3 (rarely 1) leaflets, 32–58 mm long, with petiole 7–14 mm long; leaflets lanceolate to elliptic, base obtuse, apex acute or acuminate, not sticky, with moderately dense strigose vestiture of 2-celled

bayonet hairs intermixed with short square gland hairs on both surfaces; bayonet hairs about 0.5 mm in length; short square gland hairs about 0.07 mm in length; gland-tipped finger hairs not present; terminal leaflet somewhat larger than the first pair of lateral leaflets, 23–36 × 14–22 mm, the petiolule 2–5 mm long; first pair of lateral leaflets 8–18 × 5–11 mm, short-petiolulate; pseudostipules present. Inflorescence an indeterminate pseudoterminal cymose raceme with 1 axis and 5(to 8) hermaphrodite flowers; pedicels 5–8 mm long, basally articulate, with dense strigose vestiture of 2-celled bayonet hairs intermixed with short square gland hairs. Corolla white, rotate, moderately reflexed, lobes 7–9 mm long, sinuses 4.0–6.5 mm long, the lobe:sinus ratio about 1.35:1, glabrous adaxially, sparsely strigose to hispid abaxially; calyx green, acute to acuminate, ca. 1/2 length of corolla lobes, strigose vestiture moderate to heavy; anthers pale yellow, 2.8–3.4 mm long, apices rounded, 2.8–3.4 mm long, glabrous adaxially and abaxially, filaments 0.7–1.1 mm long, fused for less than 1/4 length, with scattered stiff hairs at midpoint; style 4.7–6.1 mm long, sparingly to moderately strigose over lower half, stigma slightly capitate, exceeding staminal column by 1.6–2.4 mm. Fruits globose, the mature fruits pale green or yellowish green with darker green or purple-black stripes, with darker maculae on the lighter areas, 13–18 × 12–18 mm, round in cross section, smooth, apex rounded, locules 2; soluble solids concentration 5%–8%; seeds 100 to 175 per fruit; fruits falling from plant when ripe. Pollen grains per anther ca. 39,800, pollen:ovule ratio ca. 2170:1 (Table 1); plants self-compatible; $n = 12$ (*Martine 949*, CONN).

Habitat and distribution. Collections of this new species have been made at elevations near 2100 m on open, wet terrain in Peru. The ripened fruits of *Solanum catilliflorum* are eaten by locals. Near Auquibamba, Abancay, the species is known as pipino (Prohens, pers. obs.).

This new taxon is distinguished from morphologically similar species in *Solanum* sect. *Basarthrum* ser. *Caripensia* by its scrambling habit, small flowers (smallest in the Caripense complex), and short styles extending only slightly beyond the staminal column, similar to the other self-compatible species in section *Basarthrum*. However, these styles extend farther beyond the staminal column than any other self-compatible species in the series. Plants of this species are not only self-compatible, but autogamous, as demonstrated by greenhouse observations (G. Anderson, pers. obs.). The other self-compatible species in section *Basarthrum* are the domesticated pepino (*S. muricatum*), two herbaceous annuals (*S. canense* Rydberg, *S. suaveolens* Kunth & Bouché), and one woody perennial (*S. trachycarpum*) limited to low-elevation xeric sites in Ecuador. *Solanum catilliflorum* is easy to distinguish from *S. trachycarpum* based on the small flowers, compound leaves (vs. simple), and scrambling habit (vs. erect). Likewise, *S. catilliflorum* lacks the gland-tipped finger hairs present in the majority of the species in series *Caripensia*.

Etymology. The epithet reflects the small flowers of this species, the Latin *catillus* being a small plate or dish.

Conservation status. Estimated IUCN rank: VU. Rare and known from a limited number of localities. Total wild population still unknown.

Paratypes. U.S.A. **Connecticut:** cultivated at Univ. Conn. Ecol. & Evol. Biol. Conservatory, Storrs, 18 July 2005, *C. T. Martine & M. R. Opel 1084* (CONN) [Peru, Abancay/Apurimac, road cut near Auquibamba, 18 Mar. 2001, seed collection, *J. Prohens & F. Nuez 71*]; 18 July 2005, *C. T. Martine & M. R. Opel 1085* (CONN) [Peru: Auquibamba, 18 Mar. 2001, seed collection, *J. Prohens & F. Nuez 74*]; 18 July 2005, *C. T. Martine & M. R. Opel 1086* (CONN) [Peru, Abancay, 19 Mar. 2001, seed collection, *J. Prohens & F. Nuez 82*].

Discussion

The chromosome number (*Martine 949 & 953*, CONN), which was determined from counts of meiosis of pollen mother cells using standard methodology with acetocarmine staining and phase microscopy, is $n = 12$, the same count as all the other species of *Solanum* sect. *Basarthrum* (Bernardello & Anderson, 1990). Furthermore, assessments of fertility (e.g., pollen stains, as in Anderson, 1975) showed high stainability, which further supports that meiosis is normal and that the new species are not segregating hybrids.

Crosses were performed in the greenhouses in Valencia, Spain, and Storrs, Connecticut, U.S.A., to determine compatibility of the new species. On both continents, the results show clearly that *Solanum catilliflorum* is self-compatible (38 of 54 self-pollinations resulted in fruits with viable seeds). In addition, abundant fruits were regularly set on this species in pollinator-free greenhouses in both Valencia and in Storrs, indicating that this species is not only self-compatible, but is also autogamous. The short styles on the flowers of this species, exceeding the staminal column by about 2 mm, support the style length generalization recognized previously for other self-compatible species in *Solanum* sect. *Basarthrum*, i.e., that species with styles that exceed the staminal column by ca. 2 mm or less are self-compatible

Table 2. Crossing results. All crosses were made between different plants (self crosses discussed in the text). The values reflect the percent fruit set. The numbers in parentheses are the number of fruits set divided by the number of crosses attempted. All fruits contained morphologically normal seeds.

	S. perlongistylum (♂)	*S. catilliflorum* (♂)	*S. caripense* (♂)	*S. basendopogon* (♂)	*S. canense* (♂)
S. perlongistylum (♀)	21% (4/19)	21% (6/28)	20% (6/24)	0% (0/14)	0% (0/15)
S. catilliflorum (♀)	13% (10/23)	63% (15/24)	25% (5/20)	0% (0/22)	0% (0/15)
S. caripense (♀)	9% (2/22)	16% (3/19)	25% (6/24)	—	—
S. basendopogon (♀)	0% (0/15)	0% (0/17)	—	22% (5/23)	—
S. canense (♀)	0% (0/22)	0% (0/27)	—	—	32% (8/25)

(Anderson, 1977). Thus, in this instance, compatibility could have been inferred without pollination experiments.

The other new species, *Solanum perlongistylum*, is fully self-incompatible. This very long-styled species never set fruit upon self-pollination of more than 100 flowers (in Valencia). The style length of this species is greater than that of any other recorded in *Solanum* sect. *Basarthrum*.

Since the seminal paper by Bob Cruden nearly three decades ago (1977) stimulated interest in the ratio of pollen grains to ovule number, it has become a widely used first estimate of breeding system. A comprehensive survey for *Solanum* sect. *Basarthrum* (Mione & Anderson, 1992) provided additional support for the generalization that self-compatible species have lower pollen:ovule ratios than outcrossing taxa. The two new species described here also support this generalization. *Solanum catilliflorum*—the self-compatible, autogamous species—bears about half the pollen per flower, and about 70% of the number of ovules per flower as the self-incompatible *S. perlongistylum* (Table 1). Thus, the pollen:ovule ratio of the autogamous species is about half that of the obligately xenogamous *S. perlongistylum* (and, significantly different: $P = 0.02$). The pollen grain numbers, ovule numbers, and pollen:ovule ratios of these two species are all in accord with the general patterns observed for other species in section *Basarthrum* (Mione & Anderson, 1992). However, for both new species the pollen:ovule ratios are higher in absolute value when compared to the ratios for self-compatible and self-incompatible species in the previous study (Mione & Anderson, 1992). The number of pollen grains per flower is about the same as previously assessed; the higher pollen:ovule ratios seem mostly to be due to the ovule number, which is about half that of the species reported by Mione and Anderson (1992).

In addition, a limited number of pollinations between species were performed in greenhouses in Valencia (Table 2). Crosses between the two new *Solanum* species were moderately successful, yielding 20%–40% fruit set. All fruits included seeds that were morphologically normal, i.e., not flattened as sterile seeds in the group usually are (Anderson, 1975, 1977, 1979a); however, germination tests were not done and the vigor and fertility of F_1 plants were not tested. Successful fruit set from these interspecific crosses likely indicates some similarity between the genomes of the new species. Interestingly, the results of the reciprocal crosses between these two new species were different; when the self-incompatible species (*S. perlongistylum*) was used as the female parent, the fruit set was lower. As with the compatibility versus style length generalization above, this conforms to the generalization that self-incompatible species often perform less well as female parents in hybridization experiments (Anderson, 1979a; Lewis & Crowe, 1958; Onus & Pickersgill, 2004). Crosses with three other species from *Solanum* sect. *Basarthrum* were largely unsuccessful. Crosses with the more distant congeners (Prohens et al., 2006; Anderson & Bernardello, 1991) *S. basendopogon* and *S. canense* were, as one might expect for species as distinct as these, unsuccessful. Those crosses with the variable *S. caripense*, the most closely related species (Prohens et al., 2006), were somewhat more successful, yielding 9%–25% fruit set.

The new species described here are similar to *Solanum caripense* and are difficult to distinguish from it on the basis of morphology, as is also the case with some of the previously described species in series *Caripensia* (e.g., Anderson, 1975; Anderson & Bernardello, 1991; Prohens et al., 2006). *Solanum caripense* has the widest distribution of the species in section *Basarthrum* (Costa Rica through Peru) and is among the most widely distributed of any of the species closely related to the (tuberous or non-tuberous) potatoes (Anderson, 1975; Correll, 1962). It may well be that isolation of populations along the range of this widely distributed, montane species (or its ancestral forms) in mountain valleys may help explain the number of sibling species documented, of which *S. catilliflorum* and *S. perlongistylum* are the two most recently recognized. This pattern of speciation has also been proposed for an analogous self-compatible/incompatible species pair of tomatoes (*Solanum*

neorickii D. M. Spooner, G. J. Anderson & R. K. Jansen and *S. chmielewskii* (C. M. Rick, Kesicki, Fobes & M. Holle) D. M. Spooner, G. J. Anderson & R. K. Jansen), also from Peru (Rick et al., 1976).

Ongoing studies by Blanca et al. are assessing the relationships of these two new species to the domesticated pepino (*Solanum muricatum*). Like other members of the Caripense complex, *S. catilliflorum* and *S. perlongistylum* are closely related to this ancient Andean domesticate. Although there is no indication that either of the two new species was involved directly in the origin of the pepino, DNA sequence haplotype data (Blanca et al., unpublished data) imply that some introgression of *S. perlongistylum*, *S. catilliflorum*, or both, into the pepino may well have taken place. Such post-origin introgression is suggested for other close relatives of the pepino as well, in particular, *S. caripense* (Anderson & Jansen, 1998; Anderson et al., 1996).

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Literature Cited

Anderson, G. J. 1975. The variation and evolution of selected species of *Solanum* section *Basarthrum*. Brittonia 27: 209–222.

———. 1977. The variation and evolution of *Solanum* section *Basarthrum* II. Brittonia 29: 116 128.

———. 1979a. Systematic and evolutionary consideration of species of *Solanum* section *Basarthrum*. Pp. 549–562 *in* J. G. Hawkes, R. N. Lester & A. D. Skelding, The Biology and Taxonomy of the Solanaceae. Linn. Soc. Symp. Ser. No. 7. Academic Press, London.

———. 1979b. Dioecious *Solanum* of hermaphroditic origin is an example of a broad convergence. Nature 282: 836–838.

——— & L. M. Bernardello. 1991. The relationships of *Solanum cochoae*, a new species from Peru. Novon 1: 127–133.

——— & R. K. Jansen. 1998. Biosystematic and molecular systematic studies of *Solanum* section *Basarthrum* and the origin and relationships of the pepino dulce (*S. muricatum*). Monogr. Syst. Bot. Missouri Bot. Gard. 68: 17–32.

——— & D. A. Levine. 1982. Three taxa constitute the sexes of a single dioecious species of *Solanum*. Taxon 31: 667–672.

———, R. K. Jansen & Y. Kim. 1996. The origin and relationships of the "Pepino," *Solanum muricatum* (Solanaceae): DNA restriction fragment evidence. Econ. Bot. 50: 369–380.

———, G. Bernardello & M. Schlehofer. 1999. Continuous variation among three species of *Solanum* sect. *Anarrhichomenum* (Solanaceae): The synonymy of *S. carchiense* and *S. tetrapetalum* with *S. sodiroi*. Kurtziana 27: 233–242.

Bernardello, L. M. & G. J. Anderson. 1990. Karyotypic studies in *Solanum* section *Basarthrum* (Solanaceae). Amer. J. Bot. 77: 420–431.

Correll, D. S. 1962. The Potato and Its Wild Relatives. Texas Research Foundation, Renner, Texas.

Cruden, R. W. 1977. Pollen-ovule ratios: A conservative indicator of breeding systems in flowering plants. Evolution 31: 32 46.

Lewis, D. & L. K. Crowe. 1958. Unilateral interspecific incompatibility in flowering plants. Heredity 12: 233–256.

Mione, T. & G. J. Anderson. 1992. Pollen-ovule ratios and breeding system evolution in *Solanum* section *Basarthrum* (Solanaceae). Amer. J. Bot. 79: 279–287.

Onus, A. N. & B. Pickersgill. 2004. Unilateral incompatibility in *Capsicum* (Solanaceae): Occurrence and taxonomic distribution. Ann. Bot. 94: 289–295.

Prohens, J., J. J. Ruiz & F. Nuez. 1996. The pepino (*Solanum muricatum*, Solanaceae): A "new" crop with a history. Econ. Bot. 50: 355–368.

———, G. J. Anderson, A. Rodríguez-Burruezo & F. Nuez. 2003. Exploiting wild species for the genetic improvement of pepino (*Solanum muricatum*). J. Appl. Bot. 77: 21–27.

———, G. J. Anderson, J. M. Blanca, J. Cañizares, E. Zuriaga & F. Nuez. 2006. The implications of AFLP data for the systematics of the wild species of *Solanum* section *Basarthrum*. Syst. Bot. 31: 208–216.

Rick, C. M., E. Kesicki, J. F. Fobes & M. Holle. 1976. Genetic and biosystematic studies on two new sibling species of *Lycopersicon* from Interandean Peru. Theor. Appl. Gen. 47: 55–68.

Eight Segregates from the Neotropical Genus *Mascagnia* (Malpighiaceae)

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Abstract. In the light of morphological and molecular evidence that the genus *Mascagnia* is polyphyletic, eight segregate genera are described, discussed, and illustrated, the necessary new combinations are proposed, and five new species are described (*Amorimia camporum*, *A. kariniana*, *A. septentrionalis*, *A. velutina*, and *Niedenzuella caracasana*). Keys to genera and species are provided. The genera and species are: *Adelphia* W. R. Anderson [*A. hiraea* (Gaertner) W. R. Anderson, *A. macrophylla* (Rusby) W. R. Anderson, *A. mirabilis* (W. R. Anderson) W. R. Anderson, *A. platyrachis* (Triana & Planchon) W. R. Anderson]; *Aenigmatanthera* W. R. Anderson [*A. doniana* (Grisebach in Martius) W. R. Anderson, *A. lasiandra* (A. Jussieu) W. R. Anderson]; *Alicia* W. R. Anderson [*A. anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *A. macrodisca* (Triana & Planchon) W. R. Anderson]; *Amorimia* W. R. Anderson [*A. amazonica* (Niedenzu) W. R. Anderson, *A. camporum* W. R. Anderson, *A. concinna* (C. V. Morton) W. R. Anderson, *A. exotropica* (Grisebach in Martius) W. R. Anderson, *A. kariniana* W. R. Anderson, *A. maritima* (A. Jussieu) W. R. Anderson, *A. pubiflora* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *A. rigida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *A. septentrionalis* W. R. Anderson, *A. velutina* W. R. Anderson]; *Carolus* W. R. Anderson [*C. anderssonii* (W. R. Anderson) W. R. Anderson, *C. chasei* (W. R. Anderson) W. R. Anderson, *C. chlorocarpus* (A. Jussieu) W. R. Anderson, *C. dukei* (Cuatrecasas & Croat) W. R. Anderson, *C. renidens* (A. Jussieu) W. R. Anderson, *C. sinemariensis* (Aublet) W. R. Anderson]; *Christianella* W. R. Anderson [*C. glandulifera* (Cuatrecasas) W. R. Anderson, *C. mesoamericana* (W. R. Anderson) W. R. Anderson, *C. multiglandulosa* (Niedenzu in Chodat & Hassler) W. R. Anderson, *C. paludicola* (W. R. Anderson) W. R. Anderson, *C. surinamensis* (Kostermans) W. R. Anderson]; *Malpighiodes* Niedenzu [*M. bracteosa* (Grisebach in Martius) W. R. Anderson, *M. guianensis* (W. R. Anderson) W. R. Anderson, *M. leucanthele* (Grisebach in Martius) W. R. Anderson, *M. liesneri* (W. R. Anderson) W. R. Anderson]; and *Niedenzuella* W. R. Anderson [*N. acutifolia* (Cavanilles) W. R. Anderson, *N. caracasana* W. R. Anderson, *N. castanea* (Cuatrecasas) W. R. Anderson, *N. glabra* (Sprengel) W. R. Anderson, *N. leucosepala* (Grisebach) W. R. Anderson, *N. lucida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *N. mater-dei* (Cuatrecasas) W. R. Anderson, *N. metensis* (Cuatrecasas) W. R. Anderson, *N. mogoriifolia* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *N. multiglandulosa* (A. Jussieu) W. R. Anderson, *N. peruviana* (Niedenzu) W. R. Anderson, *N. poeppigiana* (A. Jussieu) W. R. Anderson, *N. sericea* (A. Jussieu in A. St.-Hilaire) W. R. Anderson, *N. stannea* (Grisebach) W. R. Anderson, *N. suaveolens* (A. Jussieu) W. R. Anderson, *N. warmingiana* (Grisebach) W. R. Anderson]. Lectotypes are designated for the following names: *Heladena hassleriana* Niedenzu in Chodat & Hassler, *Hiraea anisopetala* A. Jussieu in A. St.-Hilaire, *Hiraea glabra* Sprengel, *Hiraea heteropetala* A. Jussieu, *Hiraea multiflora* Grisebach, *Hiraea poeppigiana* A. Jussieu, *Hiraea pubiflora* A. Jussieu in A. St.-Hilaire, *Hiraea renidens* A. Jussieu, *Hiraea rigida* A. Jussieu in A. St.-Hilaire, *Hiraea sericea* A. Jussieu in A. St.-Hilaire, *Malpighiodes* Niedenzu, *Malpighiodes spruceana* Niedenzu, *Mascagnia* sect. *Pleuropterys* Grisebach in Martius, *Mascagnia* subsect. *Sericopetalis* Niedenzu, *Mascagnia coriacea* Grisebach in Martius, *Mascagnia exotropica* Grisebach in Martius, *Mascagnia jamaicensis* Urban & Niedenzu, *Mascagnia multiglandulosa* Niedenzu in Chodat & Hassler, *Mascagnia parnahybensis* Glaziou, *Mascagnia sericans* Niedenzu in Chodat & Hassler, *Tetrapterys fraxinifolia* A. Jussieu, *Tetrapterys guilleminiana* A. Jussieu, *Tetrapterys lancifolia* A. Jussieu, *Tetrapterys ligustrifolia* Niedenzu, *Tetrapterys lucida* A. Jussieu in A. St.-Hilaire, *Tetrapterys martiana* Niedenzu, *Tetrapterys mogoriifolia* A. Jussieu in A. St.-Hilaire, *Tetrapterys multiglandulosa* A. Jussieu, *Tetrapterys punctulata* A. Jussieu in A. St.-Hilaire.

Key words: *Adelphia*, *Aenigmatanthera*, *Alicia*, *Amorimia*, *Carolus*, *Christianella*, Malpighiaceae, *Malpighiodes*, *Mascagnia*, *Niedenzuella*.

Almost 20 Neotropical genera of Malpighiaceae produce samaras with lateral wings. The first such

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genus to be described was *Triopterys* L. (1753), a small West Indian group with Y-shaped samaras. Next came *Hiraea* Jacquin (1760), which had two-winged butterfly-shaped samaras, followed by *Tetrapterys* Cavanilles (1790) with an X-shaped samara, and then *Mascagnia* (Bertero ex DC.) Colla (1824), with an orbicular samara. Because the samara of *Triopterys* was so distinctive, few used that name for the many lateral-winged species that soon began to be described; the next-oldest name *Hiraea* was the one employed for most species that did not fall into *Triopterys* or the equally distinctive *Tetrapterys*. However, *Hiraea* is itself distinctive, with characters of the stipules and inflorescence that make it easy to segregate from the great diversity in this group of plants. Adrien de Jussieu (1843) retained a broad concept of *Hiraea*, but he divided his *Hiraea* into sections *Hiraea* and *Mascagnia*. Grisebach (1858) took the next step, restricting *Hiraea* to the species treated as section *Hiraea* by Jussieu and placing all the remaining species in a broad *Mascagnia*. Niedenzu (1928) followed Grisebach, with a restricted *Hiraea* and an inclusive *Mascagnia*, attempting to deal with the variation in the latter by dividing the genus into subgenera and sections. When I started to study the family at the New York Botanical Garden in 1971, I soon realized that Niedenzu's *Mascagnia* was an omnium-gatherum that could only be characterized as all the Neotropical Malpighiaceae with lateral-winged samaras, 10 fertile stamens, and internal stigmas that do not fit into any of the well-delineated segregates such as *Triopterys*, *Hiraea*, *Tetrapterys*, *Jubelina* A. Jussieu, and *Mezia* Niedenzu. More than a third of the species Niedenzu assigned to *Mascagnia* (his species 3–17) were morphologically coherent and included the type of *Mascagnia*, so it was clear that a large bloc of species could be segregated relatively easily and that group would keep the name *Mascagnia*. However, many species included by Niedenzu and others described since 1928 did not hold together in one or even a few equally obvious segregates. It seemed inevitable that if one started to split *Mascagnia*, the result would be the recognition of as many as a dozen genera, and I did not want to do that until I was sure those groups were not a diverse but monophyletic clade.

One of the most divergent groups was treated by Johnson (1986) under the name *Callaeum* Small. For the rest, I decided to seek help from the then-emerging field of molecular systematics. When, in the late 1980s, I persuaded my former student, Mark Chase, to initiate with me a molecular survey of Malpighiaceae, one of my principal goals was to resolve the problem of *Mascagnia*, so I made a point of including in our study set as many of the groups within *Mascagnia* as possible. Another former student, Charles Davis, is now continuing that collaboration. The resulting papers (Cameron et al., 2001; Davis et al., 2001, 2002) have provided dramatic proof that *Mascagnia* sensu Niedenzu is indeed highly polyphyletic and must be divided up. In this paper I initiate that process by describing eight segregate genera and proposing the necessary new combinations so that those names will be available for floristic treatments now in preparation.

The morphological terminology used in the keys and descriptions below conforms to that discussed in Anderson (1981).

The synonymies below are somewhat incomplete. For fuller synonymies, see my database (Malpighiaceae Nomenclature) on the website of the University of Michigan Herbarium (http://herbarium.lsa.umich.edu/).

The following key to genera accounts for most of the species Niedenzu treated under *Mascagnia* in his 1928 monograph. The numbers in parentheses following leads refer to the species in Niedenzu's treatment. Two of Niedenzu's species are not accounted for in this key: (1) his 35, *Mascagnia fluminensis* (Grisebach) Grisebach in Martius, is now referable to *Heteropterys fluminensis* (Grisebach) W. R. Anderson; Niedenzu did not confuse *Heteropterys* HBK and *Mascagnia*, but he did not see the diagnostic fruits of that species; (2) his Sp. Incert. 6, *Mascagnia spicigera* (Turczaninow) Niedenzu in Engler, is referable to *Gaudichaudia cynanchoides* HBK. *Mascagnia* s. str. is keyed, but not treated further in this paper, nor are the genera *Callaeum*, mentioned above, and *Clonodia* Grisebach in Martius, which is related to *Heteropterys*.

KEY TO THE GENERA INCLUDED UNDER *MASCAGNIA* BY NIEDENZU (1928)

1a. Lamina bearing glands in abaxial surface, between midrib and margin.
  2a. Stipules interpetiolar.
    3a. Lateral wings of samara membranous, with strongly reticulate veins, in most species continuous at base and ± circular in outline (cleft to nut at base in 2 species, chartaceous and strongly dissected in 2 species, completely lost in 1 species); petals mostly glabrous (very rarely bearing a few abaxial hairs); fruit subtended by a smooth 3-lobed disc (Niedenzu, 1928: species 3–5, 7–10, 12–14, 16, 17, Spp. Incert. 1, 5, 7) . . . . . *Mascagnia*
    3b. Lateral wings of samara chartaceous, with many fine parallel veins, cleft to nut at base and butterfly-shaped or (in 1 species) continuous at base; petals abaxially ± densely hairy; fruit not

subtended by a smooth disc (23, 30, 31, Sp. Incert. 2) . . . . . IV. *Amorimia*

2b. Stipules epipetiolar or lacking.

4a. Flowers borne ultimately in umbels or corymbs of 4(–8), or in pairs; petals yellow turning red in age; stigmas terminal or nearly so (21, 22) . . . . . VII. *Malpighiodes*

4b. Flowers borne ultimately in short to elongated pseudoracemes; petals lilac, pink, white, or some combination of those colors; stigmas internal.

5a. Sepals ± completely concealing petals throughout enlargement of bud, strongly recurved in anthesis; petals abaxially unwinged and densely tomentose or subsericeous; mericarps with membranous or chartaceous lateral wings well developed (18, 19) . . . . . III. *Alicia*

5b. Sepals leaving petals visible during enlargement of bud, appressed in anthesis; petals abaxially winged and glabrous or bearing a few hairs; mericarps with wings replaced by irregular coriaceous outgrowths (1, 2, 32) . . . . . *Clonodia*

1b. Lamina bearing glands on or embedded in margin, or eglandular.

6a. Sepals bearing a row of small marginal glands, these sessile or subsessile to long-stalked, clavate or capitate (20) . . . . . VI. *Christianella*

6b. Sepals without marginal glands.

7a. Sepals longer than petals in bud, imbricated and concealing petals until anthesis or in a few species separating to expose petals in enlarging bud, strongly revolute in anthesis (26, 27) . . . . . VIII. *Niedenzuella*

7b. Sepals much exceeded by petals in enlarging bud, appressed or recurved only at apex in anthesis.

8a. Shrubs, never twining; flowers borne singly or in umbels of 2–4 in axils of full-sized leaves; fruit subtended by a smooth 3-lobed disc (6, 11, 15) . . . . . *Mascagnia* s.l.

8b. Woody vines, occasionally described as shrubby; flowers many in axillary or terminal inflorescences, often pseudoracemes or panicles; fruit not subtended by a smooth disc.

9a. One bracteole of each pair bearing 1 large eccentric gland; petiole usually bearing 2 large knoblike glands near apex, sometimes eglandular; styles ± bowed or lyrate (33, 34, Sp. Incert. 3) . . . . . I. *Adelphia*

9b. Both bracteoles eglandular; petiole eglandular or bearing glands, the glands if present not especially large; styles straight or bowed.

10a. Posterior 3 anthers smaller than the other 7; stigma transversely expanded, elliptical; stipules epipetiolar (36–39) . . . . . *Callaeum*

10b. Anthers all ± alike; stigma circular or laterally compressed; stipules interpetiolar or epipetiolar.

11a. Petals abaxially densely sericeous; anthers glabrous or bearing a few hairs; stipules interpetiolar (often deciduous) (25, 28, 29) . . . . . V. *Carolus*

11b. Petals glabrous or bearing a few hairs; anthers abaxially sericeous; stipules borne on petiole, at or slightly above the base, persistent (24, Sp. Incert. 4) . . II. *Aenigmatanthera*

I. Adelphia W. R. Anderson, gen. nov. TYPE: *Adelphia hiraea* (Gaertner) W. R. Anderson.

Lianae lignosae; petiolus plerumque prope apicem biglandulosus glandulis protuberantibus; lamina eglandulosa vel margine in dimidio distali glandulis minimis instructa; stipulae interpetiolares; inflorescentia pseudoracemus vel panicula elongata floribus plerumque 2, 3, vel 4 in quoque nodo portatis; pedunculi floriferi bene evoluti; 1 bracteola cujusque paris eglandulosa, altera uniglandulifera glandulo excentrico; pedicellus in alabastro parum circinatus; sepala per anthesin plusminusve appressa; petala glabra, 4 lateralia lutea, posticum luteum vel luteum rubrumque, fimbriatum; carpella fere distincta in ovario; styli arcuati vel lyrati, stigmate introrso, apice dorsaliter truncati, apiculati, vel breviuncinati; samara alis lateralibus apice basique usque ad nucem incisis (alis lateralibus rudimentariis in *A. mirabili*), nuce subglobosa.

Woody vines. Petiole usually biglandular above middle, the glands when present protuberant, usually large and knoblike; lamina eglandular or bearing very small marginal glands, often drawn out into vascularized cilia, on distal half, especially near apex; tertiary veins weakly or not scalariform; stipules very small, triangular, borne on stem beside base of petiole. Inflorescence an open, elongated, axillary or terminal panicle or pseudoraceme with the flowers borne singly or (most often) in 2s, 3s, or 4s; floriferous bracts eglandular; floriferous peduncle well developed; bracteoles borne at apex of peduncle, one of each pair bearing 1 bulging eccentric abaxial gland; pedicel slightly circinate in bud. Sepals ovate or broadly rounded, separating to expose petals during enlargement of bud, ± appressed in anthesis, the

lateral 4 or all 5 abaxially biglandular; corolla bilaterally symmetrical, the posterior petal long-fimbriate and strongly differentiated from the lateral 4; petals yellow or the posterior yellow and red, glabrous; androecium bilaterally symmetrical; stamens 10, all fertile, glabrous; filaments distinct or only slightly connate at very base, longer opposite sepals, shorter opposite petals; anthers ± alike, mostly larger on longer filaments; carpels nearly distinct in ovary; styles inserted low on ventral face of carpels, ± bowed or lyrate, the anterior mostly shorter and less strongly bent than the posterior 2; apex of styles with a large internal stigma and dorsally truncate, apiculate, or bearing a hook up to 0.5 mm long. Fruit dry, breaking apart into samaras separating from a short pyramidal torus; samara orbicular to butterfly-shaped with lateral wings dominant, borne on upper edge of nut, membranous or chartaceous with many fine strongly parallel veins, cleft to nut at base and apex, the margin undulate or erose (lateral wings rudimentary and the small dorsal wing dominant in *A. mirabilis*); dorsal wing smaller and distinct from lateral wings at both apex and base; intermediate winglets absent; ventral areole circular, partially surrounded by an irregular callose thickening.

The molecular studies published to date (Cameron et al., 2001: 1856; Davis et al., 2001: 1839, and 2002: 6835) consistently place this genus [represented by *Mascagnia hippocrateoides* (Triana & Planchon) Niedenzu] in a clade with *Excentradenia* W. R. Anderson, *Hiraea*, an undescribed genus [represented by *Mascagnia dipholiphylla* (Small) Bullock], and (in Davis et al., 2002) *Lophopterys* A. Jussieu in Delessert, but mostly without strong support or good resolution of the relationships among the five genera. The morphology suggests to me that this genus is probably sister to *Excentradenia*, hence the name *Adelphia*, from the Greek word for sister, *adelphe*. *Adelphia* and *Excentradenia* are alike in most characters, including the eccentric bracteole glands for which *Excentradenia* was named (Anderson, 1997). However, they have dramatically different inflorescences, that of *Excentradenia* being a short, compact raceme of 3–7(–9) umbels of four flowers each, with the floriferous peduncles very short to absent. The sepals in *Excentradenia* are elongated, and revolute in anthesis; the tertiary leaf veins are strongly scalariform; and except for a few populations of *E. adenophora* (Sandwith) W. R. Anderson the lateral wings of the samara are continuous at the base. The inflorescence in *Excentradenia* probably resulted from condensation of an ancestral inflorescence resembling that of *Adelphia*, so it is possible that *Excentradenia* will eventually be found to nest within the *Adelphia* clade. If so, we can reconsider these genera then; for now it seems best to recognize these very different-looking groups as separate genera.

Adelphia comprises four species of the West Indies, Mesoamerica, and western South America.

KEY TO THE SPECIES OF *ADELPHIA*

1a. Petiole of larger leaves (20–)25–60 mm long; lamina of larger leaves (21–)23–30 × (11–)13–19 cm, eglandular; samara (55)60–80 mm wide, ± orbicular, or the lateral wings rudimentary; posterior petal proximally glandular-fimbriate, distally eglandular-fimbriate; sepals abaxially densely and evenly appressed-tomentose.
  2a. Samara with the lateral wings rudimentary, 1–2 mm wide, the dorsal wing larger than the laterals; Amazonian Peru . . . . . 3. *A. mirabilis*
  2b. Samara with the lateral wings well developed, 25–40 mm wide, 50–72 mm high, the dorsal wing much smaller than the laterals; Bolivia and Amazonian Peru . . . . . 2. *A. macrophylla*
1b. Petiole of larger leaves 6–15 (rarely –27) mm long; lamina of larger leaves 9–19(–26) × 4–10 (–12.5) cm, eglandular or bearing very small marginal glands, often drawn out into vascularized cilia, on distal half, especially near apex; samara 15–55 mm wide, ± butterfly-shaped; posterior petal eglandular-fimbriate all around margin; sepals abaxially glabrous or proximally sericeous, ciliate on margin.
  3a. Lateral wings of samara 5–10 mm wide, 10–25 mm high, coriaceous; Pacific coast of Colombia . . . . . 4. *A. platyrachis*
  3b. Lateral wings of samara 12–25 mm wide, 15–40 mm high, membranous; Jamaica, southeastern Mexico, Central America, and northwestern South America . . . . . 1. *A. hiraea*

1. Adelphia hiraea (Gaertner) W. R. Anderson, comb. nov. Basionym: *Triopterys hiraea* Gaertner, Fruct. 2: 169, pl. 116. 1790. *Mascagnia hiraea* (Gaertner) Fawcett & Rendle, Fl. Jamaica 4: 240. 1920. TYPE: Jamaica. *W. Wright s.n.* (holotype, BM Banks Hb.). Figure 1.

Hiraea hippocrateoides Triana & Planchon, Ann. Sci. Nat. Bot., Sér. 4, 18: 328. 1862. *Mascagnia hippocrateoides* (Triana & Planchon) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 24. 1908. TYPE: Colombia. Vicinity of Anapoima, *J. Triana s.n.* (holotype, COL 17026; isotype, BM [MICH, WRA neg. 81-2-10]).

Mascagnia jamaicensis Urban & Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 25. 1908. TYPE: Jamaica. *W. Harris 9862* (lectotype, designated here, NY; duplicates, BM, K).

Of the five syntypes, all from Jamaica, *Harris 9862* is the most complete and representative.

Mascagnia excelsa Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser., 23: 168. 1944. TYPE: Guatemala. Izabal: Río Dulce, *J. A. Steyermark 39456* (holotype, F).

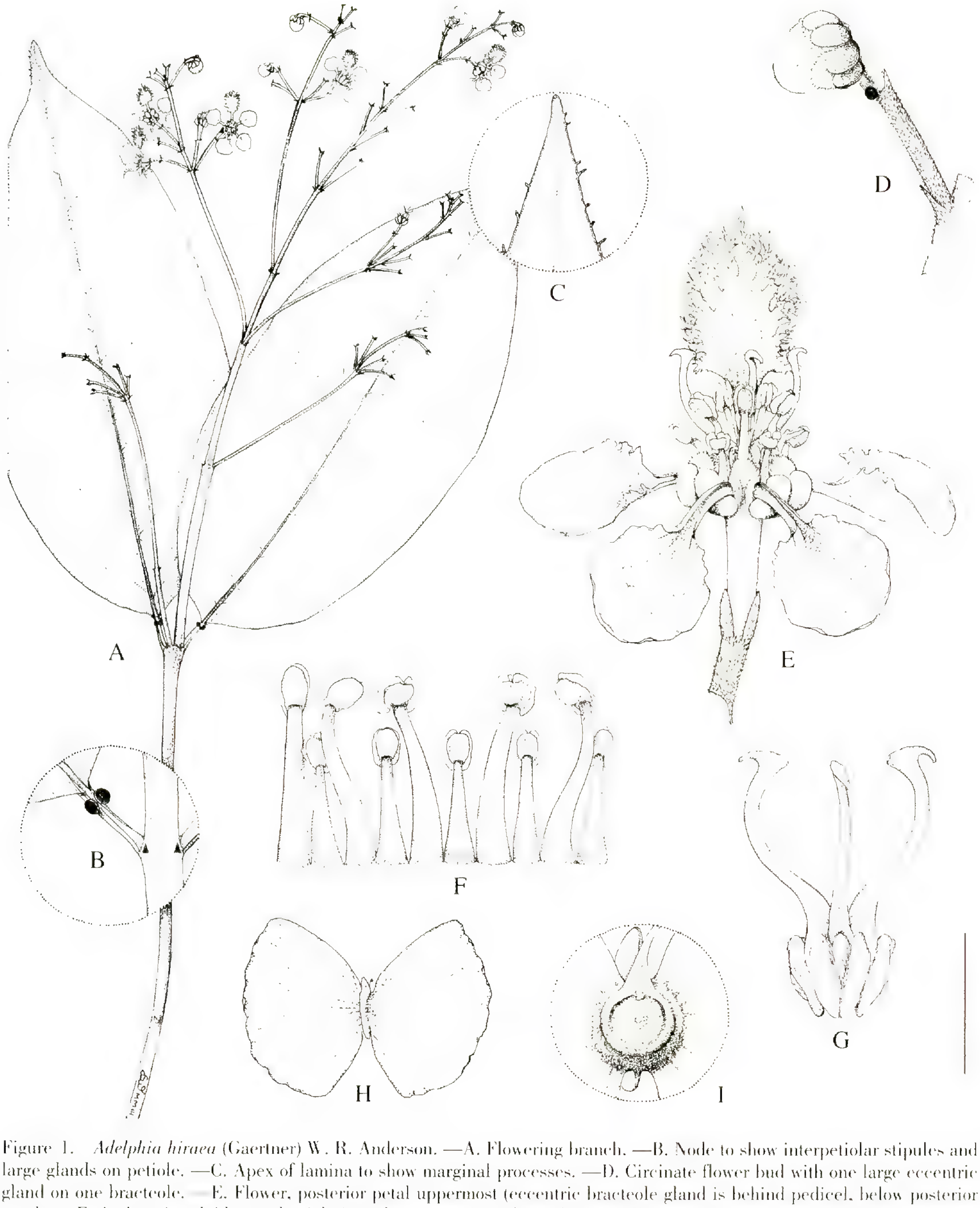

Figure 1. *Adelphia hiraea* (Gaertner) W. R. Anderson. —A. Flowering branch. —B. Node to show interpetiolar stipules and large glands on petiole. —C. Apex of lamina to show marginal processes. —D. Circinate flower bud with one large eccentric gland on one bracteole. —E. Flower, posterior petal uppermost (eccentric bracteole gland is behind pedicel, below posterior petal). —F. Androecium laid out, abaxial view, the stamen just above the letter F opposite posterior petal. —G. Gynoecium, the anterior style in center. —H. Samara, abaxial view. —I. Ventral areole of samara. Scale bar equivalents: A, 4 cm; B & C, 1.3 cm; D, 8 mm; E, 6 mm; F, 2.7 mm; G, 3.3 mm; H, 3 cm; I, 8 mm. A–G, *Foster 2313* (MICH); H & I, *Davidse et al. 20520* (MICH).

This species is known from Jamaica, southeastern Mexico (*Davidse et al. 20520*, MICH), Central America, and northwestern South America.

2. Adelphia macrophylla (Rusby) W. R. Anderson, comb. nov. Basionym: *Mascagnia macrophylla* Rusby, Mem. New York Bot. Gard. 7: 272. 1927. TYPE: Bolivia. Beni: Rurrenabaque, *M. Cárdenas 2044* (lectotype, designated by Anderson (1980: 21), NY; duplicates, K, MICH).

This species is known from Bolivia and Amazonian Peru (*Díaz & Ruiz 851A*, MICH).

3. **Adelphia mirabilis** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia mirabilis* W. R. Anderson, Contr. Univ. Michigan Herb. 14: 19. 1980. TYPE: Peru. San Martín: Puente Colombia to Shapaja, *T. C. Plowman 6019* (holotype, MICH).

4. **Adelphia platyrachis** (Triana & Planchon) W. R. Anderson, comb. nov. Basionym: *Hiraea platyrachis* Triana & Planchon, Ann. Sci. Nat. Bot., Sér. 4, 18: 328. 1862. *Mascagnia hippocrateoides* var. *platyrachis* (Triana & Planchon) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 24. 1908. *Mascagnia platyrachis* (Triana & Planchon) Cuatrecasas, Webbia 13: 374. 1958. TYPE: Colombia. Chocó: Isthmus of San Pablo, *J. Triana s.n.* (holotype, COL not seen; isotypes, BM, G, K, P).

II. Aenigmatanthera W. R. Anderson, gen. nov. TYPE: *Aenigmatanthera lasiandra* (A. Jussieu) W. R. Anderson.

Lianae lignosae vel frutices; lamina eglandulosa vel aliquot glandulis minutis marginalibus instructa; stipulae minutae prope basim petioli portatae; bracteae bracteolaeque parvae eglandulosae; sepala quam petala multo breviora in alabastro; petala lutea, glabra vel abaxialiter paucipilifera; filamenta abaxialiter glabra vel sparsim vel dense sericea; antherae abaxialiter plus minusve sericea; styli recti et erecti vel distaliter recurvati, stigmate terminali vel introrso; samara alis lateralibus apice basique usque ad nucem incisis.

Woody vines, occasionally described as shrubs. Leaves opposite; petiole eglandular or biglandular at or above middle; lamina eglandular or bearing several tiny glands embedded in the margin; stipules very small (sometimes apparently lacking), triangular, borne on petiole at or slightly above base, persistent. Inflorescence an axillary or terminal pseudoraceme or, more commonly, a panicle of pseudoracemes, the flowers ± decussate, sometimes crowded distally to form a corymb or umbel; bracts and bracteoles eglandular, short, narrowly triangular, ± spreading, persistent or deciduous in fruit, the bracteoles borne at or somewhat below apex of peduncle; floriferous peduncle developed, much shorter than pedicel. Sepals triangular or ovate, only moderately exceeding the glands, much exceeded by the petals in enlarging bud, appressed in bud, appressed to slightly recurved at apex in anthesis, the lateral 4 abaxially biglandular and the anterior eglandular or all 5 biglandular; corolla bilaterally symmetrical, the posterior petal erect, its claw thicker than in lateral petals; petals small, yellow, glabrous or bearing a few straight appressed hairs abaxially in center, shallowly erose; androecium radially symmetrical; stamens 10, all fertile; filaments connate at base, straight, alike but somewhat longer opposite sepals than opposite petals, glabrous or abaxially sparsely to densely sericeous, especially distally; anthers alike, abaxially ± densely white-sericeous on the dark connective, at least proximally; carpels connate their whole length in ovary; styles stout, straight, erect to somewhat spreading distally, with large terminal or internal circular or laterally compressed stigmas, dorsally rounded at apex. Fruit dry, breaking apart into samaras separating from a short pyramidal torus; samara butterfly-shaped with lateral wings dominant, chartaceous with many fine strongly parallel veins, trapezoidal, cleft to nut at base and apex, the margin coarsely dentate or lobed, occasionally deeply and irregularly lobed; dorsal wing small, distinct at base and apex, extended forward at apex between lateral wings; raised ribs or irregular outgrowths present between dorsal and lateral wings; ventral areole ovate.

The name *Aenigmatanthera* comes from the Latin words for riddle or mystery (*aenigma*) and anther (*anthera*). It refers to the odd stamens and especially the anthers, one of the important differences distinguishing this genus from *Niedenzuella* W. R. Anderson.

I have had great difficulty in placing these two closely related species. The combination of marginal leaf glands, epipetiolar stipules, short sepals leaving the nearly glabrous yellow petals well exposed in the enlarging bud, and a butterfly-shaped samara excludes their assignment to any of the other genera recognized here. They most resemble *Niedenzuella*, which has decussate pseudoracemes, marginal leaf glands, tiny epipetiolar stipules, and yellow petals that are glabrous or thinly sericeous. Moreover, the samaras of *Aenigmatanthera lasiandra* sometimes show irregular dissection of the lateral wings, as in *Niedenzuella stannea* (Grisebach) W. R. Anderson. Grisebach also recognized this similarity, treating *A. lasiandra* as a variety of *Tetrapterys mogoriifolia* A. Jussieu in A. St.-Hilaire [= *Niedenzuella mogoriifolia* (A. Jussieu in A. St.-Hilaire) W. R. Anderson]. However, the sepals in *Niedenzuella* are very different from those of *Aenigmatanthera*. They are papery and elongated, much exceeding the glands, being imbricated over the petals during much of the enlargement of the bud, then becoming revolute in anthesis. The anthers in *Niedenzuella* are short and glabrous or bear a few hairs on the locules, not elongated and densely sericeous on the connective as in *Aenigmatanthera*. The carpels in *Niedenzuella* are connate only at the base and distally distinct, whereas in *Aenigmatanthera* they are connate their whole length. Another

genus that resembles *Aenigmatanthera* is *Carolus* W. R. Anderson, but that has interpetiolar stipules, densely sericeous petals, and glabrous or subglabrous anthers. There is still no published molecular evidence on the relationships of *Aenigmatanthera*. Unless and until DNA sequences indicate a different disposition of these two species, it seems best to recognize their unique combination of characters by giving them generic status.

Lowrie (1982: 123–124) noted the peculiarity of the pollen in this group of plants: "*Mascagnia lasiandra* is remarkable among clonodioids for its regularity: perfectly colpoidal, ora always centered in colpi, colpi always perpendicular to the equator, no branching or fusing of the colpi to speak of. I would place this pollen type very close to byrsonimoids, especially *Mcvaughia* which I find to be virtually indistinguishable from it." *Mcvaughia* W. R. Anderson has four broad fusiform colpi; both species of *Aenigmatanthera* have four or five similar colpi.

Aenigmatanthera is a genus of two South American species.

Key to the Species of *Aenigmatanthera*

1a. Lamina of larger leaves 3–9 × 1–4 cm, initially loosely sericeous, soon glabrate or persistently sericeous on midrib; pseudoracemes always condensed to umbels or very tight corymbs of 2–8 (mostly 4–6) flowers; filaments abaxially sparsely sericeous to glabrate; anthers 1–1.5 mm long, straight in anthesis, abaxially ± densely sericeous proximally, less hairy distally; northeastern Brazil (Maranhão and Ceará) . . . . . 1. *A. doniana*

1b. Lamina of larger leaves 8–16(–21) × (3–)4–9 (–11) cm, soon glabrate; pseudoracemes mostly ± elongated (i.e., with measurable internodes between pairs of flowers), mostly comprising 6–14 flowers; filaments abaxially densely and persistently sericeous distally; anthers 1.5–2 mm long, recurved in anthesis, abaxially densely and persistently sericeous their whole length; Bolivia and south-central Brazil, rarely in southern Amazonas and Pará, Brazil . . . . . 2. *A. lasiandra*

1. Aenigmatanthera doniana (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia doniana* Grisebach in Martius, Fl. Bras. 12(1): 94. 1858. TYPE: Brazil. Maranhão, *G. Don 85* (holotype, BR).

This species in known only from northeastern Brazil [Maranhão and Ceará (*Fernandes & Matos s.n.* [EAC 11640], MICH)].

2. Aenigmatanthera lasiandra (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea lasiandra* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 259. 1840. *Tetrapterys mogoriifolia* var. *lasiandra* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 81. 1858. *Mascagnia lasiandra* (A. Jussieu) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 56. 1909. TYPE: Brazil. Mato Grosso: Cuiabá, *Mart. Herb. Fl. Bras. s.n. [657]* (holotype, P; isotypes, G, L). Figure 2.

Hiraea nitens S. Moore, Trans. Linn. Soc. London, Ser. 2 Bot., 4: 328. 1895. *Mascagnia nitens* (S. Moore) Niedenzu in Engler, Pflanzenr. IV, 141: 123. 1928. TYPE: Brazil. Mato Grosso: Serra da Chapada, *S. Moore 74* (holotype, BM).

Aenigmatanthera lasiandra is common in northern and eastern Bolivia (*Nee 31847*, MICH) and south-central Brazil, and rare in southern Amazonas, Brazil (*Prance et al. 14200*, MICH), and Pará (*Maciel et al. 782*, MICH).

III. Alicia W. R. Anderson, gen. nov. TYPE: *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson.

Hiraea sect. *Hiraeostachys* Grisebach, Linnaea 13: 242. 1839. LECTOTYPE, designated by Morton (1968: 320): *Hiraea anisopetala* A. Jussieu in A. St.-Hilaire [= *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson].

Mascagnia subsect. *Sericopetalis* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 15. 1908. LECTOTYPE, designated here: *Mascagnia anisopetala* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius [= *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson].

Lianae lignosae; lamina in pagina abaxiali aliquot glandulis parvis impressis instructa; stipulae parvae epipetiolares prope basim petioli portatae; sepala valvata, 4 lateralia biglandulifera; petala alba, alba et rosea, rosea, vel lilacina, abaxialiter dense tomentosa vel subsericea; stamina glabra, inter se similaria; styli recti, inter se similares, apice dorsaliter rotundati, truncati, vel apiculati; samara alis lateralibus apice distinctis, basi plerumque continuis.

Woody vines. Petiole bearing 2–4(–8) small glands in 2 rows; lamina bearing few to many small glands impressed in abaxial surface in a row parallel to but set in from the margin; stipules minute, triangular, borne on petiole at or slightly above base. Inflorescence a terminal and lateral panicle with the flowers borne decussate or distally irregularly in short to elongated pseudoracemes; floriferous peduncle well developed; bracteoles borne between middle and apex of peduncle or near apex. Sepals valvate, completely concealing petals during enlargement of bud, recurved in anthesis, the lateral 4 biglandular, the anterior usually eglandular; corolla bilaterally symmetrical to almost radial; petals white, white and pink, pink, or lilac, spatulate, abaxially unwinged and

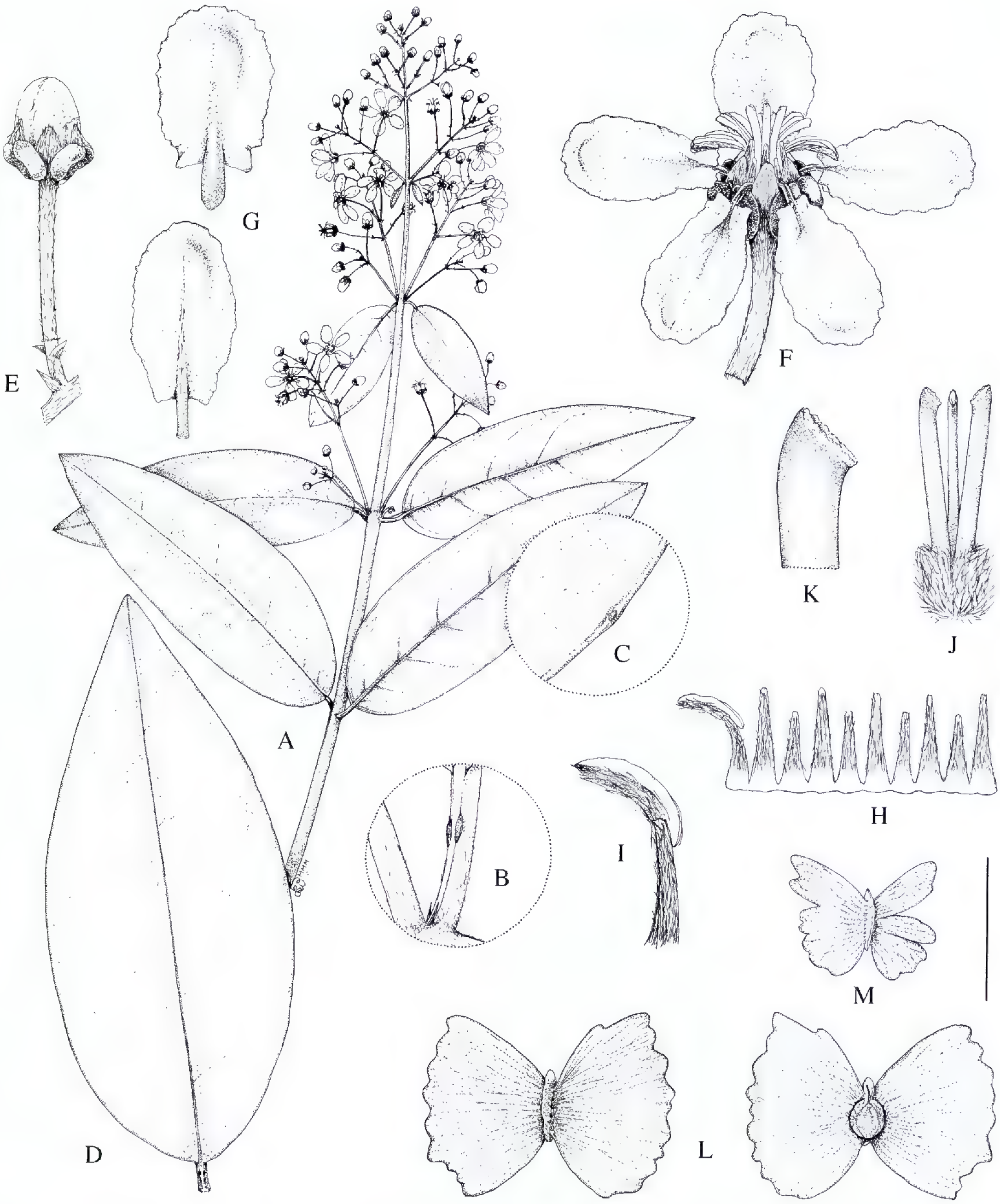

Figure 2. *Aenigmatanthera lasiandra* (A. Jussieu) W. R. Anderson. —A. Flowering branch. —B. Petiole to show glands and stipules at base. —C. Abaxial margin of lamina. —D. Detached large leaf, adaxial view. —E. Flower bud. —F. Flower, posterior petal uppermost, five anterior anthers removed. —G. Abaxial views of posterior petal (above) and lateral petal (below). —H. Androecium laid out, abaxial view, all anthers but one removed, the longer filaments opposite sepals. —I. Stamen enlarged. —J. Gynoecium, the anterior style in center. —K. Apex of a posterior style. —L. Full-sized samara, abaxial view (left) and adaxial view (right). —M. Small irregular samara, abaxial view. Scale bar equivalents: A, 4 cm; B, 5 mm; C, 2 mm; D, 4 cm; E, 6.7 mm; F, 5 mm; G & H, 4 mm; I & J, 2 mm; K, 0.7 mm; L & M, 1.6 cm. A–C, E–K, *Irwin et al. 16768* (MICH); D, *Dubs 1549* (MICH); L, *Hatschbach et al. 6664* (MICH); M, *Heringer et al. 2135* (MICH).

densely tomentose or subsericeous, adaxially glabrous or sparsely tomentose, especially the lateral 4; stamens 10, all fertile, glabrous; filaments 1/3–2/3-connate, straight, ± alike; anthers alike; carpels completely connate in ovary; styles straight or nearly so, subequal, laterally somewhat flattened distally, dorsally rounded, truncate, or apiculate at apex, the stigmas internal. Fruit dry, breaking apart into

samaras separating from a short pyramidal torus; samara suborbicular or transversely elliptical with lateral wings dominant, membranous or chartaceous with distal looping anastomoses, cleft to nut at apex, usually continuous at base (rarely cleft to nut at base), the margin usually entire or undulate; dorsal wing small, distinct at apex, distinct at base or very abruptly confluent with lateral wing; ventral areole ovate. Lombello and Forni-Martins (2002: 246) reported chromosome counts of $n = 30$ and $2n = 60$ for *Alicia anisopetala* (as *Mascagnia anisopetala*); I have not had the opportunity to verify the identification of their voucher.

I am happy to name this genus in honor of my friend Alicia Lourteig (1913–2003), co-author of the first account of the Malpighiaceae of Argentina (O'Donell & Lourteig, 1943). During my 1981 visit to study the great wealth of Malpighiaceae in the herbarium of the Muséum National d'Histoire Naturelle in Paris, Dr. Lourteig was unfailingly helpful and hospitable, making my stay in Paris both pleasant and profitable.

In the molecular trees published to date (Cameron et al., 2001; Davis et al., 2001, 2002), *Alicia* was represented by *A. anisopetala* (as *Mascagnia anisopetala*). The best-resolved of those trees, that of Davis et al. (2002), places *Alicia* with 90% bootstrap support in a clade with *Callaeum* and *Malpighiodes* Niedenzu (as *Mascagnia bracteosa* Grisebach in Martius). All three genera have lateral-winged samaras and epipetiolar stipules. *Alicia* is distinguished from *Callaeum* and *Malpighiodes* by the combination of glands in the abaxial leaf surface, flowers in pseudoracemes, and densely hairy white/pink/lilac petals that are completely concealed by the sepals during enlargement of the bud. In *A. anisopetala* and some populations of *A. macrodisca* (Triana & Planchon) W. R. Anderson the petals are strongly dimorphic, with the posterior petal much larger than the four lateral petals, which makes those plants quite distinctive.

Alicia consists of two species widespread in South America.

Key to the Species of *Alicia*

1a. Lamina abaxially densely and persistently tomentose (rarely glabrescent in age), the hairs stalked, with their crosspieces non-parallel, straight to twisted; petals strongly dimorphic, the posterior petal much larger than the lateral petals, often nearly twice as long and much broader; samara tomentose or loosely sericeous to glabrate, 2.8–5 (–6.5) cm across, mostly less than 4 cm . . . . . 1. *A. anisopetala*

1b. Lamina abaxially sericeous to glabrate, with the hairs sessile, straight, and parallel; petals subequal to strongly dimorphic; samara tightly sericeous to glabrate, 1–7.5 cm across . . . . . 2. *A. macrodisca*

1. Alicia anisopetala (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea anisopetala* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 15. 1832 [1833]. *Mascagnia anisopetala* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius, Fl. Bras. 12(1): 95. 1858. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro], *A. St.-Hilaire Catal. D no. 766* (lectotype, designated here, P [MICH, WRA neg. 81-21-19]; isotypes, P). Figure 3.

Hiraea macrocarpa Chodat, Arch. Sci. Phys. Nat. III 24: 500. 1890. TYPE: Paraguay. Asunción, *B. Balansa 2408* (holotype, G [F neg. 24285]; isotypes, K, P).

Mascagnia nobilis C. V. Morton, Proc. Biol. Soc. Wash. 45: 51. 1932. TYPE: Peru. Loreto: Yurimaguas, *E. P. Killip & A. C. Smith 27557* (holotype, US; isotype, NY).

2. Alicia macrodisca (Triana & Planchon) W. R. Anderson, comb. nov. Basionym: *Hiraea macrodisca* Triana & Planchon, Ann. Sci. Nat. Bot., Sér. 4, 18: 326. 1862. *Mascagnia macrodisca* (Triana & Planchon) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 16. 1908. *Mascagnia anisopetala* var. *macrodisca* (Triana & Planchon) Kostermans, Meded. Bot. Mus. Herb. Rijksuniv. Utrecht 25: 5. 1936. TYPE: Colombia. Meta: Villavicencio, *J. Triana 5568-6* (holotype, COL; isotypes, BM, G, K, MO).

IV. Amorimia W. R. Anderson, gen. nov. TYPE: *Amorimia rigida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson.

Mascagnia sect. *Pleuropterys* Grisebach in Martius, Fl. Bras. 12(1): 91. 1858. LECTOTYPE, designated here: *Mascagnia pubiflora* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius [= *Amorimia pubiflora* (A. Jussieu in A. St.-Hilaire) W. R. Anderson].

Lianae lignosae; petiolus plerumque eglandulosus, rarius apice biglandulosus; lamina plerumque 2–multis glandulis parvis impressis in pagina abaxiali inter costam et marginem instructa (glandulae marginales in *A. concinna*); stipulae interpetiolares; inflorescentia pseudoracemus vel panicula elongata; bracteae floriferae magnae (2–8 mm longae), patentes, saepe lanceolatae et glandulis submarginalibus prope basim instructae; petala abaxialiter ± dense pilosa (in *A. concinna* parce sericea), lutea vel aetate rubescentia; carpella omnino connata in ovario; styli recti et erecti vel distaliter recurvati, stigmate introrso, apice dorsaliter rotundati, truncati, acuti, vel breviuncinati; samara alis lateralibus apice usque ad nucem incisis, basi continuis vel usque ad nucem incisis.

Woody vines, sometimes described as shrubs. Leaves usually opposite, sometimes subopposite or alternate; petiole eglandular or biglandular near apex;

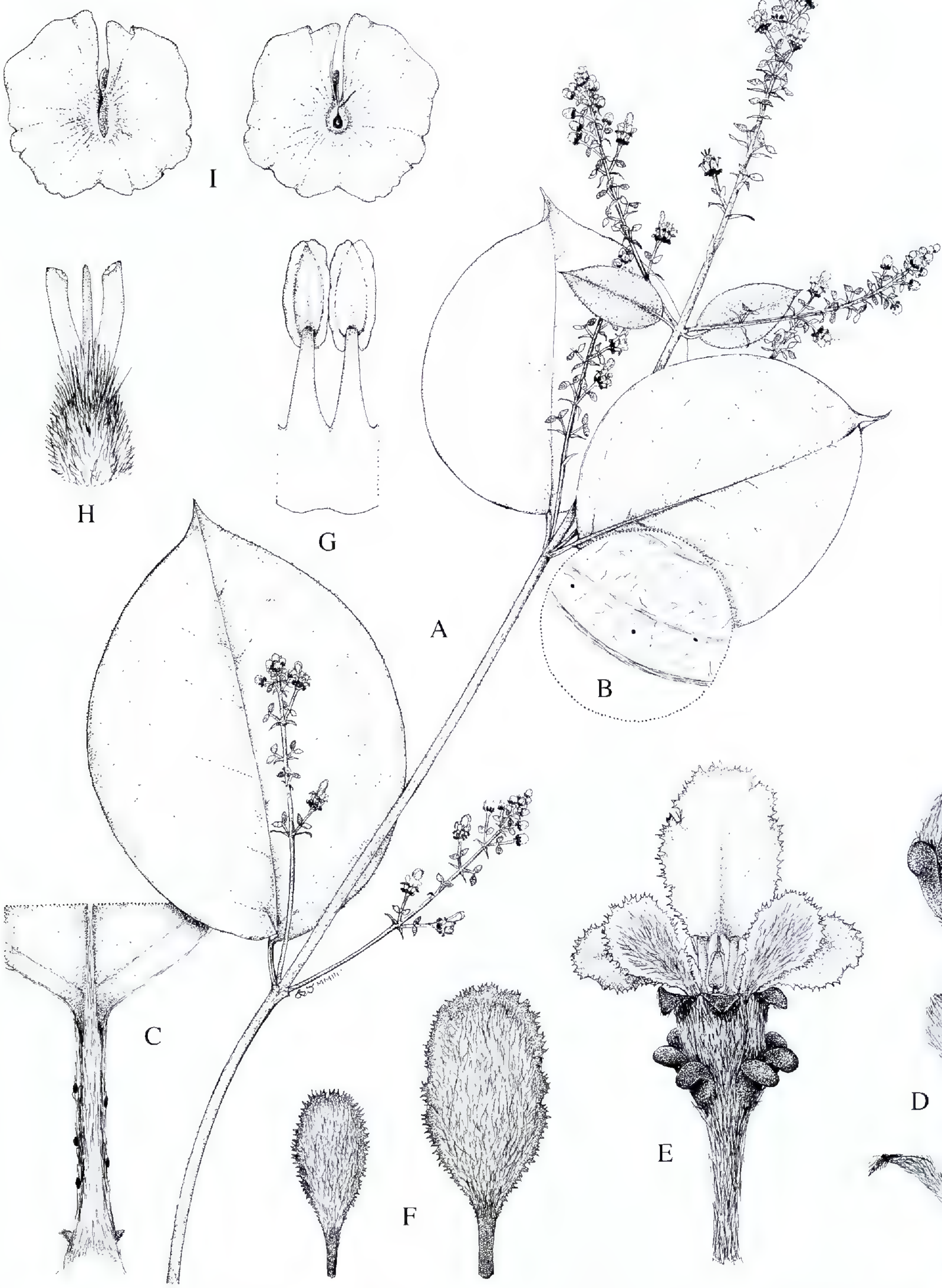

Figure 3. *Alicia anisopetala* (A. Jussieu in A. St.-Hilaire) W. R. Anderson. —A. Flowering branch. —B. Abaxial surface of lamina enlarged to show tiny glands. —C. Adaxial view of petiole to show small glands and basal stipules. —D. Flower bud. —E. Flower, posterior petal uppermost. —F. Abaxial views of lateral petal (left) and posterior petal (right). —G. Abaxial view of two stamens. —H. Gynoecium. —I. Samara, abaxial view (left) and adaxial view (right). Scale bar equivalents: A, 4 cm; B, 8 mm; C, 5 mm; D–F, 4 mm; G & H, 2 mm; I, 2.7 cm. A–D, *Anderson 10176* (MICH); E–I, *Anderson 11786* (MICH).

lamina eglandular or bearing 2–many small glands impressed in abaxial surface between midrib and margin, on very margin at base in *Amorimia concinna* but usually somewhat set in from margin in other species; stipules very small, triangular, borne on stem between petioles. Inflorescence with the flowers decussate to irregularly inserted in elongated terminal or axillary pseudoracemes or panicles; bracts large (2–8 mm long) and spreading, often lanceolate and short-petiolate, often bearing 1(2) submarginal or marginal glands on each side near base; floriferous peduncle ± well developed; bracteoles like bracts but narrower, shorter, and less often bearing glands, borne at or somewhat below apex of peduncle. Sepals leaving petals exposed during enlargement of bud, appressed or revolute in anthesis, the lateral 4 bearing large paired abaxial glands (occasionally the 2 glands adjacent to anterior sepal absent), the anterior eglandular (rarely bearing 1 or 2 small glands); corolla bilaterally symmetrical, the posterior petal erect, its claw usually longer and thicker and its limb usually smaller, the lateral 4 petals spreading to reflexed; petals yellow or yellow turning red-orange in age (especially the claws), abaxially densely velutinous, tomentose, or sericeous, at least on proximal half (only thinly sericeous in *A. concinna*), adaxially glabrous or densely to sparsely hairy on distal half; limb of petals entire or slightly erose; stamens 10, all fertile; filaments connate at base, straight, subequal or longer opposite sepals; anthers alike, glabrous or variously hairy; carpels connate their whole length in ovary; styles terete or flattened laterally toward apex, erect and straight to recurved, subequal or the anterior somewhat shorter, slenderer, and more recurved than the posterior 2; apex of styles dorsally rounded or truncate or acute to short-hooked, the stigma internal. Fruit dry, breaking apart into samaras separating from a short or moderately high pyramidal torus; samara butterfly-shaped to depressed-elliptical with lateral wings dominant, chartaceous with many fine parallel veins, cleft to nut at apex, continuous at base or cleft part-way or completely to nut, the margin entire or undulate to coarsely dentate; dorsal wing small, distinct at apex and base or confluent with lateral wings at base; nut almost always smooth between lateral and dorsal wings; ventral areole broadly ovate or rotund to very narrowly elliptical.

The name *Amorimia* honors my Brazilian friend and colleague, André M. Amorim (b. 1966), who has begun a most promising career in the study of Malpighiaceae, concentrating at present on the large and difficult genus *Heteropterys*.

Amorimia is easily recognized by its leaf glands usually on the abaxial surface (not the margin), interpetiolar stipules, yellow abaxially hairy petals, large spreading gland-bearing bracts, and straight erect styles. The genus is not represented in any published molecular phylogeny. If one considers the morphological characters that seem to be most informative in this group of genera (position of stipules and leaf glands, exposure of petals in bud, degree to which carpels are connate in ovary), it would seem to resemble most closely *Mascagnia* s. str. *Mascagnia* differs from *Amorimia* in its glabrous petals, small mostly eglandular bracts, membranous samara with a prominent reticulum of arching anastomoses and the lateral wing usually continuous at base, and the fleshy disc that subtends the samaras.

Amorimia is a genus of South America, comprising ten species.

KEY TO THE SPECIES OF *AMORIMIA*

1a. Petals adaxially glabrous, or hairy only on claw, or bearing only a few scattered hairs distally on limb.
  2a. Lamina cordate or subcordate at base; south-central Brazil . . . . . 7. *A. pubiflora*
  2b. Lamina cuneate or rounded at base; western South America.
    3a. Petals only sparsely sericeous abaxially in center of limb, otherwise glabrous; bracts linear, eglandular; leaf glands marginal; Colombia . . . . . 3. *A. concinna*
    3b. Petals densely and evenly hairy over the whole abaxial surface; bracts lanceolate, usually biglandular near base; leaf glands borne in abaxial surface, at least the distal glands set in from margin, the glands at base of lamina sometimes almost marginal.
      4a. Lamina originally thinly sericeous below, soon glabrate or sericeous only on midrib with straight appressed hairs; southwestern Amazonia . . . . . 1. *A. amazonica*
      4b. Lamina at least originally velutinous below, the hairs persistent or the lamina glabrescent at maturity.
        5a. Petiole of larger leaves (5–)7–10 mm long; sepals mostly appressed in anthesis; posterior petal strongly differentiated from lateral petals, with a much longer claw and smaller limb; limb of lateral petals 7.5–8.5 × 6–7 mm; lateral wings of samara 30–42 mm high, 20–30 mm wide; dorsal wing of samara extending to base of nut or nearly so; Guayas, Ecuador . . . . . 5. *A. kariniana*
        5b. Petiole of larger leaves up to 6 mm long, mostly shorter; sepals revolute at apex in

anthesis; posterior petal only moderately differentiated from lateral petals, the claw thicker and slightly longer, the limb somewhat smaller; limb of lateral petals 5.5–7.5(–8) × 4–6 mm; lateral wings of samara (11–)14–30 mm high, (6–)10–18 mm wide; dorsal wing of samara usually extending at most to middle of nut, from there to base represented only by a rib; Cajamarca and San Martín, Peru . . . . 2. *A. camporum*

1b. Petals adaxially abundantly hairy distally on limb; eastern Brazil and adjacent Argentina [*A. rigida* complex].

6a. Lamina densely velutinous on both sides, the hairs V-shaped, persistent below, eventually deciduous above; Minas Gerais, Brazil . . . . . 10. *A. velutina*

6b. Lamina initially sericeous or appressed-tomentose on both sides with ± appressed hairs, soon glabrate on both sides or with some hairs persistent below.

7a. Lamina with some hairs long-persistent below, especially on midrib, to eventually glabrescent; northeastern Brazil (Ceará, Paraíba, Pernambuco) . . . . . 9. *A. septentrionalis*

7b. Lamina very soon quite glabrate; eastern Brazil from Bahia south to Rio Grande do Sul, and Misiones, Argentina.

8a. Ventral areole of samara narrowly elliptical or ovate, (2–)2.2–3.5 times as long as wide; sepals appressed in anthesis; styles dorsally rounded or truncate at apex . . . . . 8. *A. rigida*

8b. Ventral areole of samara broadly ovate to rotund, 1–1.8 times as long as wide; sepals recurved or revolute at apex in anthesis; styles dorsally acute or apiculate at apex.

9a. Samara 4.3–6 cm high and 5–8 cm wide; lamina usually biglandular at or just above base and eglandular distally; bracts subsessile, the broad petiole up to 0.5 mm long; leaves often alternate or subopposite, sometimes opposite . . . . . 6. *A. maritima*

9b. Samara up to 3.3 cm high and 4.8 cm wide, mostly smaller; lamina often bearing 2(–4) glands well above base and sometimes also biglandular at or just above base; bracts notably petiolate, the slender petiole often 1 mm long; leaves mostly opposite, sometimes subopposite; Paraná, Santa Catarina, and Rio Grande do Sul, Brazil, and Misiones, Argentina . . . . . 4. *A. exotropica*

1. Amorimia amazonica (Niedenzu) W. R. Anderson, comb. nov. Basionym: *Mascagnia amazonica* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 8: 59. 1926. TYPE: Brazil. Amazonas: Seringal S. Francisco, Rio Acre, *E. Ule 9478* (holotype, B†; fragment of holotype, NY; isotypes, G, K, L).

This species is known from southwestern Amazonia [Peru (*Foster 11965*, MICH), Bolivia (*Steinbach 339*, MICH), and adjacent Brazil].

2. Amorimia camporum W. R. Anderson, sp. nov. TYPE: Peru. Cajamarca: San Ignacio, Distr. Chirinos, entre La Catagua y Tablón, 5°19′S, 78°47′W, 550–650 m, 9 Feb. 1996 (fl), *J. Campos & O. Díaz 2490* (holotype, MICH).

Liana; petiolus 2–6 mm longus; lamina foliorum majorum 5–11 × 3–6.7 cm, basi cuneata vel rotundata, abaxialiter pertinaciter velutina vel interdum glabrescens; flores in pseudoracemis 5–18 cm longis 10–40-floris portati; bracteae 2–7 mm longae, lanceolatae, plerumque glanduliferae; sepala plerumque apice ± revoluta in anthesin; petala lutea, abaxialiter dense subsericea vel velutina, adaxialiter glabra; petala lateralia ungue 1–2 mm longo, limbo 5.5–7.5(−8) × 4–6 mm; petalum posticum ungue 2–2.5 mm longo, limbo 5–7.5 × 3.5–5 mm; antherae glabrae; samara alis lateralibus discretis, (11–)14–30 mm altis, (6–)10–18 mm latis; ala dorsali (1–)3–6 mm alta, (1–)2 mm lata, plerumque usque ad medium nucis evoluta.

Woody vines; stems persistently short-velutinous or glabrate in age. Leaves opposite; petiole 2–6 mm long, velutinous, eglandular or biglandular near apex; lamina of larger leaves 5–11 × 3–6.7 cm, elliptical or ovate, cuneate or rounded at base, acute, obtuse, rounded, or abruptly short-acuminate and often apiculate at apex, eglandular or bearing (1) several small impressed abaxial glands in a row parallel to margin but set in from it up to 5 mm, initially densely velutinous on both sides with very short V-shaped hairs, soon or eventually glabrate above, the abaxial surface mostly persistently velutinous but occasionally glabrescent in age, the lateral veins 4–7 on each side of midrib, the reticulum ± prominent on both surfaces, especially above; stipules 0.3–0.5 mm long, black, very narrowly triangular, borne on stem between petioles, persistent or deciduous. Flowers borne in open pseudoracemes 5–18 cm long, containing 10–40 flowers with the flowers decussate proximally and in no consistent arrangement distally, the pseudoracemes axillary or terminal, the axes (including peduncles and pedicels) velutinous; bracts and bracteoles persistent or deciduous during enlargement of fruits; lowest bracts sometimes transitional from vegetative leaves, more distal bracts 2–7 × (0.7–)1–2.5 mm, lanceolate, spreading, usually

bearing 2(–4) marginal glands near base, velutinous; peduncle 2–11 mm long; bracteoles like bracts but smaller and sometimes eglandular, mostly borne at apex of peduncle; pedicel 4–10 mm long, somewhat inflated distally. Sepals 1–2 mm long beyond glands, 1.5 mm wide, triangular or ovate, acute to obtuse at apex, at least somewhat revolute at apex in anthesis, abaxially densely subvelutinous or sericeous, adaxially glabrous, the abaxial glands 8 on 4 lateral sepals (rarely 1 gland on the anterior sepal), 1.8–3 mm long; petals yellow, abaxially densely subsericeous to velutinous on claw and limb, adaxially glabrous, the limb entire or sinuate; lateral petals with claw 1–2 mm long, limb 5.5–7.5(–8) × 4–6 mm, orbicular or broadly obovate or elliptical; posterior petal moderately differentiated from laterals by its often thicker and slightly longer claw and somewhat smaller limb, the claw 2–2.5 mm long and limb 5–7.5 × 3.5–5 mm, orbicular; stamens glabrous; filaments 1.3–2.5 mm long, connate at base; anthers 0.8–1.1 mm long, alike, reflexed in anthesis, the connective brown or dark red; ovary 1.3–2 mm high, densely velutinous; styles 1.4–1.8 mm long, flattened laterally toward apex, glabrous or proximally pilose, erect to divergent, dorsally acute at apex, alike or the anterior slightly shorter than the posterior 2 and often more divergent. Samara (1.5–)2–3.5 cm wide, butterfly-shaped with the flabellate lateral wings distinct at base and apex, short-velutinous on nut and wings; lateral wings (11–)14–30 mm high, (6–)10–18 mm wide, the margin sinuate, erose, or coarsely dentate; dorsal wing (1–)3–6 mm high, (1–)2 mm wide, widest at apex extended between lateral wings and narrowing abruptly downward, usually extending up to half the distance to base and thereafter represented only by a rib (but rarely extending as a narrow crest almost to base), distinct from lateral wings, entire; ventral areole ovate, 4.5–7 × 2–3 mm.

Phenology. Collected with flowers and fruits from January to April and in September.

Ecology and distribution. Dry and wet forests at 400–800 m in Cajamarca and San Martín, Peru.

Etymology. The epithet of this species honors one of the collectors of the type and four of the paratypes, the Peruvian botanist José Ricardo Campos (b. 1955).

Amorimia camporum differs from the *A. rigida* complex of eastern Brazil and adjacent Argentina by having its petals adaxially glabrous, and it is immediately distinguished from *A. amazonica*, whose range overlaps that of *A. camporum*, by the velutinous lamina. It differs from *A. pubiflora*, of south-central Brazil, by its smaller petals, its lamina that is usually cuneate at the base, and the dorsal wing of its samara, which usually extends only to the middle of the nut, not to the base as in *A. pubiflora*. *Amorimia kariniana*, of Ecuador, differs from *A. camporum* in having a longer petiole, sepals mostly appressed in anthesis, the posterior petal strongly differentiated from the lateral petals, larger lateral petals, and larger samaras with the dorsal wing extending to the base of the nut or nearly so.

Paratypes. PERU. **Cajamarca.** San Ignacio: Distr. Huarango, entre Puerto Tabalozo y Nueva Esperanza, *Campos & Díaz 2015* (MO); Distr. Huarango, Puerto Ciruelo–Camino a Huarango, *Campos & Díaz 2658* (MICH); Distr. Chirinos, "Las Juntas," *Campos & Díaz 3266* (MICH); Chirinos, Las Juntas, *Campos 4846* (MICH). **San Martín:** Huallaga, entre Bellavista y Baños, *Ferreyra 4744* (MICH); Juanjui, alto Río Huallaga, *Klug 4259* (MO, NY, US); Huinguillo, *Woytkowski 7183* (MICH, MO); Juanjui, *Woytkowski 7200 & 7202* (MICH, MO).

3. Amorimia concinna (C. V. Morton) W. R. Anderson, comb. nov. Basionym: *Mascagnia concinna* C. V. Morton, Publ. Carnegie Inst. Wash. 461: 130. 1936. *Mascagnia dumetorum* C. V. Morton, Proc. Biol. Soc. Wash. 45: 53. 1932, nom. illeg., non *M. dumetorum* Grisebach, 1879. TYPE: Colombia. Bolívar: Sincé, *F. W. Pennell 4033* (holotype, US; isotypes, GH, NY).

4. Amorimia exotropica (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia exotropica* Grisebach in Martius, Fl. Bras. 12(1): 93. 1858. TYPE: Brazil. Rio Grande do Sul: near Porto Alegre, *H. Fox 19* (lectotype, designated here, K).

Of the two syntypes, both from near Porto Alegre, *Fox 19* seems to me to be the fuller, more representative collection.

This species occurs in the southernmost states of Brazil [Paraná (*Cordeiro 1217*, MICH), Santa Catarina (*Krapovickas & Cristóbal 39391*, MICH), and Rio Grande do Sul] and adjacent Misiones, Argentina (*Vanni et al. 2903*, MICH).

5. Amorimia kariniana W. R. Anderson, sp. nov. TYPE: Ecuador. Guayas: Guayaquil, Cerro Azul, 50 m, 22 Oct. 1958 (fl), *G. Harling 3026* (holotype, S; isotype, MICH). Figure 4.

Liana; petiolus (5–)7–10 mm longus; lamina foliorum majorum 8.5–13 × 5–8.5 cm, basi cuneata vel truncata, abaxialiter ± pertinaciter velutina; flores in pseudoracemis 7–18 cm longis 16–26-floris portati; bracteae 3–6 × 1–3 mm, patentes, glanduliferae; pedunculi 2–7 mm longi; pedicelli 6–9 mm longi; sepala apice obtusa vel rotundata, plerumque appressa in anthesin; petala lutea, abaxialiter dense subsericea vel velutina, adaxialiter glabra vel apice

paucis pilis instructa; petala lateralia ungue 1.5–2 mm longo, limbo 7.5–8.5 × 6–7 mm; petalum posticum ungue 3.5–4 mm longo, limbo 6–6.5 × 4.5–5 mm; antherae glabrae; samara alis lateralibus discretis, 30–42 mm altis, 20–30 mm latis, ala dorsali 12–15 mm alta, 4 mm lata, usque ad basim nucis evoluta vel paene.

Vine with slender woody stems, occasionally described as a shrub; stems loosely sericeous or velutinous, glabrate in age. Leaves opposite; petiole (5–)7–10 mm long, sericeous or velutinous to glabrate, eglandular or biglandular between middle and apex; lamina of larger leaves 8.5–13 × 5–8.5 cm, broadly elliptical, cuneate to truncate at base, abruptly short-acuminate at apex, eglandular or, mostly, bearing a row of several (up to 10) small impressed abaxial glands parallel to margin but set in from it up to 3 mm or nearly marginal at base, initially moderately or thinly velutinous on both sides with V-shaped hairs (except often loosely sericeous on midrib), soon nearly glabrate above, at least some hairs long-persistent below, especially on veins, the lateral veins 5–7 on each side of midrib, the reticulum prominent on both surfaces; stipules 0.3–0.7 mm long, triangular, borne on stem between petioles, persistent or deciduous. Flowers borne in elongated, open pseudoracemes 7–18 cm long, containing 16–26 flowers with the flowers ± decussate proximally and in no consistent arrangement distally, the pseudoracemes axillary or terminal, the axes (including peduncles and pedicels) velutinous; bracts and bracteoles persistent or deciduous during enlargement of fruits; bracts 3–6 × 1–3 mm, lanceolate, spreading, abaxially biglandular near base, velutinous especially abaxially; peduncle 2–7 mm long; bracteoles like bracts but much smaller (especially narrower) and mostly eglandular, borne at apex of peduncle; pedicel 6–9 mm long, somewhat inflated distally. Sepals 1.5–2 mm long beyond glands, 1.7–2.5 mm wide, ovate, obtuse to rounded at apex, appressed in anthesis (or slightly revolute at sides), abaxially densely velutinous or subsericeous, adaxially glabrous, the abaxial glands 8 on 4 lateral sepals, 2.5–3.5 mm long; petals yellow, abaxially densely subsericeous to velutinous on claw and limb, adaxially glabrous or bearing a few scattered hairs near apex, the limb entire or sinuate; lateral petals with claw 1.5–2 mm long, limb 7.5–8.5 × 6–7 mm, broadly obovate; posterior petal strongly differentiated from laterals, the claw 3.5–4 mm long and limb 6–6.5 × 4.5–5 mm, spatulate; filaments 2.5–3.5 mm long, connate at base, glabrous or abaxially sparsely pilose; anthers 0.8–1.4 mm long, alike, glabrous, the connective brown; ovary 1.7–2 mm high, densely velutinous; styles 2–2.2 mm long, terete or flattened laterally toward apex, sericeous proximally, erect to divergent, dorsally truncate at apex, alike or the anterior slenderer, shorter, and more strongly recurved than the posterior 2. Samara 4.5–5 cm wide, butterfly-shaped with the flabellate or depressed-elliptical lateral wings distinct at base and apex, velutinous on nut and wings; lateral wings 30–42 mm high, 20–30 mm wide, the margin sinuate or erose; dorsal wing 12–15 mm high, 4 mm wide, widest at apex extended between lateral wings and narrowing downward but with measurable width almost or quite to base of nut, distinct from lateral wings at base and apex, entire or sinuate; ventral areole ovate or elliptical, 8–12 × 4–6 mm.

Phenology. Collected with flowers in June, July, September, and October, and with fruits in February and June.

Ecology and distribution. Known only from Guayas, Ecuador, at 50–200 m, in roadside thickets, pastures, and dry tropical forests, and along streams.

Etymology. Amorimia kariniana is named in honor of Karin Weishaar Douthit (b. 1926), who drew the figure of it and all the other beautiful illustrations in this paper. Karin has been drawing Malpighiaceae for me and my colleagues for over 30 years, and I want to pay tribute to her outstanding service. Her eye is as sharp, and her hand as steady, as when she started working for me soon after I joined the faculty of the University of Michigan in 1974.

Amorimia kariniana resembles *A. pubiflora* in its velutinous leaves and large flowers, but it differs in the lamina having a cuneate base and more glands distributed in a longitudinal row, the mostly shorter peduncles and pedicels, and the posterior petal, which is more differentiated from the lateral petals here than in *A. pubiflora*. See the discussion under *A. camporum* for the distinctions between that species and *A. kariniana*.

Paratypes. ECUADOR. **Guayas**: vicinity of Guayaquil, Cerro Azul, *Asplund 16617 & 17586* (S); E of Las Juntas, *Fagerlind & Wibom 242* (S); Pedro Carbo, *Haught 3070* (MICH, NY, US); Guayaquil, road to Aguas Piedras, *Rowlee & Mixter 1109* (US); Guayaquil, Cerro Mirador de los Monos, *Rubio & Palacios 2445* (MICH, MO).

6. Amorimia maritima (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea maritima* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 259. 1840. TYPE: Brazil. Bahia: "in petrosis maritimis," *P. Salzmann s.n.* (holotype, G; isotypes, G, K, P).

This species is known only from near the Atlantic coast in the Brazilian states of Bahia and Espírito Santo (*Döbereiner & Tokarnia 2009*, MICH).

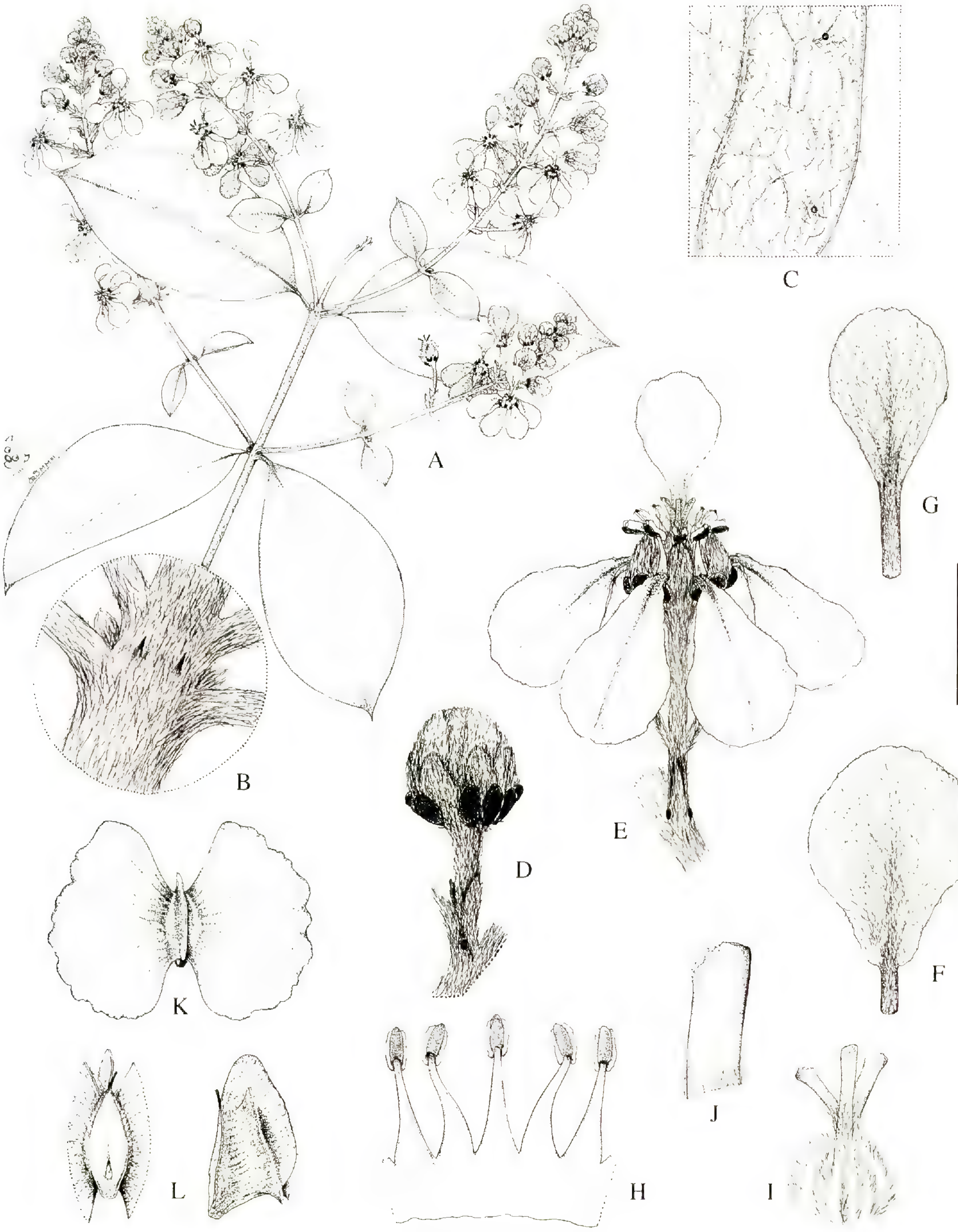

Figure 4. *Amorimia kariniana* W. R. Anderson. —A. Flowering branch. —B. Node with stipules. —C. Abaxial surface of lamina near margin, showing glands and separate hairs. —D. Flower bud. —E. Flower, posterior petal uppermost. —F. Lateral petal, abaxial view. —G. Posterior petal, abaxial view. —H. Portion of androecium, abaxial view, the stamen in center opposite posterior petal. —I. Gynoecium, anterior style to left. —J. Distal portion of a posterior style. —K. Samara, abaxial view. —L. Samara with lateral wings cut away, adaxial view (left) and lateral view (right). Scale bar equivalents: A, 4 cm; B, 4 mm; C, 8 mm; D, 5.7 mm; E, 8 mm; F & G, 5.7 mm; H & I, 3.3 mm; J, 1.3 mm; K, 2.7 cm; L, 1.3 cm. A–J, *Harling 3026* (S); K & L, *Rubio & Palacios 2445* (MICH).

7. Amorimia pubiflora (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea pubiflora* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 14. 1832 [1833]. *Mascagnia pubiflora* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius, Fl. Bras. 12(1): 91. 1858. TYPE: Brazil. Minas Gerais: near Mangahy, *A. St.-Hilaire s.n.* (lectotype, designated here, P [F neg. 35631]; isotypes, P).

There are three type sheets in P, all annotated by Jussieu, probably all from the same gathering. The one I am designating lectotype is the fullest, most representative specimen.

Mascagnia parnahybensis Glaziou, Bull. Soc. Bot. France 52 (Mém. 3): 77. 1905. *Mascagnia pubiflora* var. *grandifolia* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 23. 1908. TYPE: Brazil. Goiás: Rio Parnahyba, *A. Glaziou 20757* (lectotype, designated here, P [MICH, WRA neg. 81-22-7]; isotypes, G, K, P).

Glaziou 20757 was the only collection cited. There are two sheets in P, as well as duplicates in G and K. It is appropriate to make one of the two P sheets lectotype, because Glaziou was associated with that herbarium, and the fuller of the two specimens is the one I have selected as lectotype.

8. Amorimia rigida (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea rigida* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 14. 1832 [1833]. *Mascagnia rigida* (A. Jussieu in A. St.-Hilaire) Grisebach in Martius, Fl. Bras. 12(1): 92. 1858. TYPE: Brazil. Minas Gerais: S. Miguel de Jequitinhonha, *A. St.-Hilaire Catal. B[1] no. 1501* (lectotype, designated here, P [MICH, WRA neg. 81-22-15]; isotypes, P). Figure 5.

The St.-Hilaire collection cited above is the only potential type in P. There are three sheets, all annotated by Jussieu; I have selected the best material of those three to designate as lectotype.

Mascagnia coriacea Grisebach in Martius, Fl. Bras. 12(1): 92. 1858. *Mascagnia rigida* subsp. *coriacea* (Grisebach in Martius) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 19. 1908. TYPE: Brazil. Minas Gerais: Tejuco [Diamantina], *G. Gardner 5394* (lectotype, designated here, K; duplicate, BM).

Grisebach cited two syntypes, *Barbosa s.n.* from Rio de Janeiro and *Gardner 5394* from Minas Gerais. I have not been able to locate the Barbosa collection. The Gardner collection is a good representative of this species, and can serve well as lectotype; the sheet at K is better material than the one at BM.

Amorimia rigida is known from the Brazilian states of Minas Gerais, Bahia (*Amorim 3565*, MICH), Espírito Santo (*Döbereiner & Tokarnia 1765*, MICH), and Rio de Janeiro (*Andreata 373*, MICH).

9. Amorimia septentrionalis W. R. Anderson, sp. nov. TYPE: Brazil. Ceará: sine loc., 22 June 1958 (fl/fr), *J. Döbereiner 538* (holotype, MICH). Figure 6.

Liana; lamina foliorum majorum 6–12(−14) × 3.3–7.5 cm, elliptica vel parum ovata obovatave, plerumque biglandulosa prope basim, sericea vel appresso-tomentosa mox glabrescens aliquot pilis abaxialibus saepe persistentibus; flores in pseudoracemis 6–25 cm longis 10–70-floris portati; bracteae 2–4.5(−6) × 1–2 mm, patentes, plerumque glanduliferae; sepala apice acuta, revoluta in anthesin; petala lutea, utrinque tomentosa, subaequalia, ungue 0.5–1.5 mm longo, limbo 3.2–6 × 2–2.7 mm, basi cuneato; antherae 0.8–1.5 mm longae, basi piliferae; styli apice dorsaliter acuti vel breviuncinati; samara alis lateralibus discretis, (11–)20–33 mm altis, 8–20 mm latis, ala dorsali 7–15 mm alta, 1.5–5 mm lata, areola ventrali late ovata, 4.5–7 × 4–5 mm.

Vine with slender woody stems, sometimes described as a shrub; stems sericeous or appressed-tomentose to glabrate. Leaves opposite; petiole 3–6 mm long, sericeous to glabrate, usually eglandular, occasionally biglandular at very apex; lamina of larger leaves 6–12(−14) × 3.3–7.5 cm, elliptical or slightly ovate or obovate, cuneate or rounded at base, obtuse or acute or (usually) acuminate at apex, mostly bearing 1(2) small impressed glands on each side of abaxial surface, at base or up to 1.5 cm above base, between midrib and margin, initially sericeous or appressed-tomentose on both sides, the hairs soon deciduous or some often persistent on abaxial surface, the lateral veins 4–7 on each side of midrib; stipules 0.4–1.5 mm long, triangular, borne on stem between petioles, persistent or deciduous. Flowers borne in pseudoracemes 6–25 cm long, containing 10–70 flowers with the flowers often decussate proximally and in no consistent arrangement distally, the pseudoracemes axillary or arrayed in lateral or terminal panicles, the axes loosely sericeous or velutinous; bracts and bracteoles mostly deciduous during enlargement of fruits; bracts 2–4.5(−6) × 1–2 mm, lanceolate, often narrowed at base to a short petiole, spreading, mostly bearing 1(2) bulging marginal or submarginal glands on each side below middle, loosely sericeous especially abaxially; peduncle 0.5–4 mm long, loosely sericeous or velutinous; bracteoles 1.5–2 × 0.6–1 mm, elliptical, mostly eglandular but sometimes bearing 2 small glands, borne at or somewhat below apex of peduncle; pedicel 3–5 mm long, loosely sericeous or velutinous. Sepals 1.5–2.2 × 1.2–2 mm, triangular, acute at apex,

Figure 5. *Amorimia rigida* (A. Jussieu in A. St.-Hilaire) W. R. Anderson. —A. Branch with flowers and immature fruits. —B. Petiole and stipule. —C. Abaxial surface of lamina showing gland. —D. Flower bud. —E. Flower, lateral view, posterior petal uppermost. —F. Lateral petal, abaxial view (above) and adaxial view (below). —G. Posterior petal, adaxial view. —H. Stamen, abaxial view. —I. Gynoecium, anterior style to left. —J. Apex of style. —K. Samara, abaxial view (above) and adaxial view (below). Scale bar equivalents: A, 4 cm; B–D, 4 mm; E, 5.7 mm; F & G, 4 mm; H & I, 2 mm; J, 0.7 mm; K, 2 cm. A–J, *Anderson 13691* (MICH); K, *Voblick 3876* (MICH).

revolute in anthesis, abaxially sericeous, adaxially glabrous or thinly sericeous, the abaxial glands (6–)8(–10), 2–2.8 mm long; petals yellow, abaxially densely tomentose on claw and limb, adaxially tomentose on distal half or third of limb, the limb elliptical or spatulate, cuneate at base, entire; lateral petals with claw 0.5–1.2 mm long, limb 3.2–6 × 2–2.7 mm; posterior petal hardly different from laterals

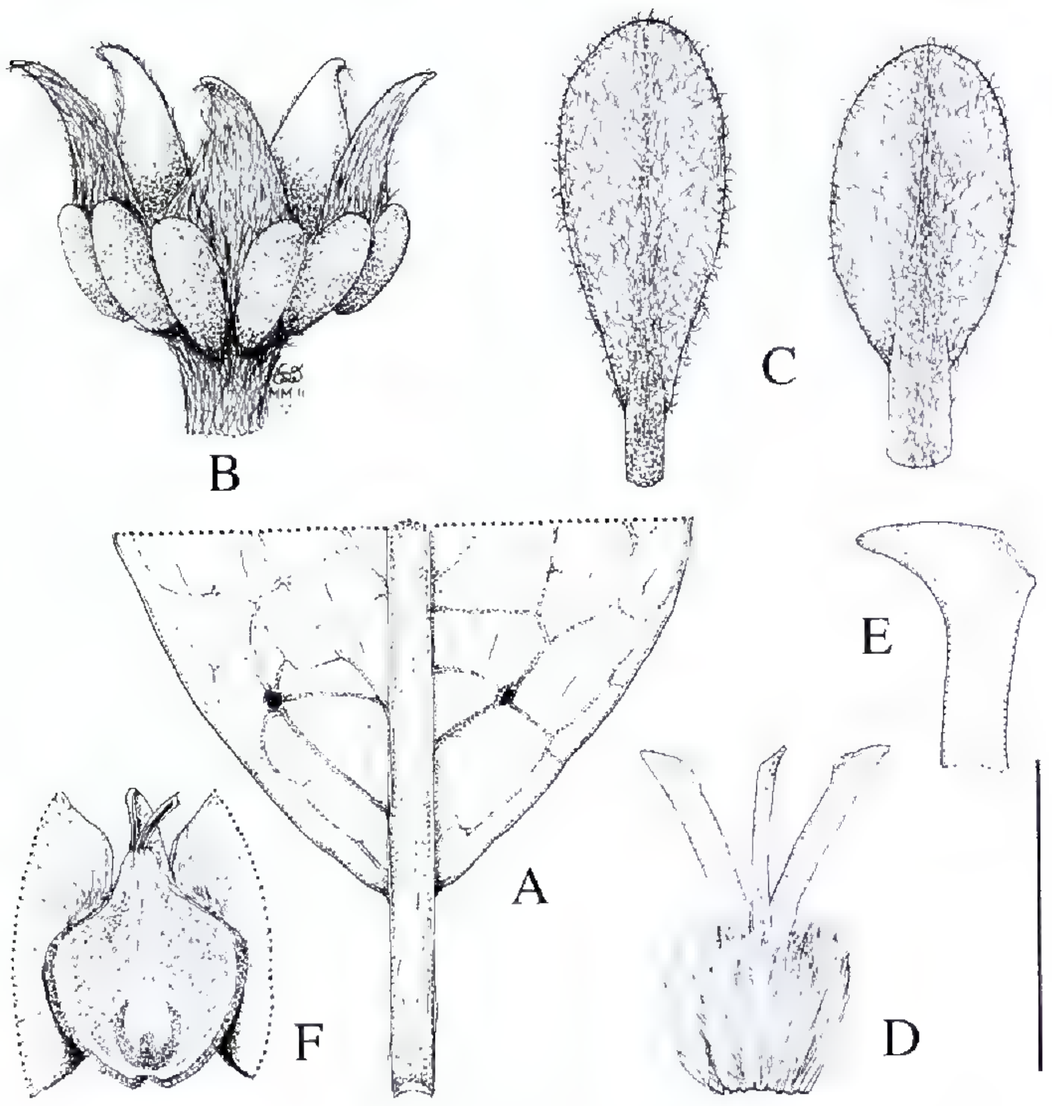

Figure 6. *Amorimia septentrionalis* W. R. Anderson. —A. Base of leaf, abaxial view. —B. Old flower to show shape of sepals. —C. Petals, abaxial view, lateral petal (left) and posterior petal (right). —D. Gynoecium, anterior style in center. —E. Apex of anterior style. —F. Ventral areole of samara, lateral wings cut away. Scale bar equivalents: A, 8 mm; B & C, 4 mm; D, 3.3 mm; E, 1.3 mm; F, 8 mm. A, B & F, *Döbereiner 538* (MICH); C–E, *Martins & Nunes s.n.* [EAC 8652] (MICH).

except in standing erect and having a thicker claw, the claw 0.7–1.5 mm long, limb 3.3–4.2 × 2–2.5 mm; filaments 1.5–2 mm long, connate at base, glabrous or abaxially sericeous; anthers 0.8–1.5 mm long, with a tuft of hairs at base and sometimes also a few hairs at apex, the connective dark red; ovary 1.2–1.5 mm high, densely sericeous; styles 1.2–2.5 mm long, terete or somewhat flattened laterally toward apex, sericeous at base and distally glabrous, initially erect, soon or eventually recurved, acute or short-hooked dorsally at apex, the anterior slenderer, shorter, and more strongly recurved than the posterior 2. Samara 2.5–4.5 cm wide, butterfly-shaped with the flabellate lateral wings distinct at base and apex, loosely sericeous on nut and wings; lateral wings (11–)20–33 mm high, 8–20 mm wide, the margin entire, sinuate, or coarsely dentate; dorsal wing 7–15 mm high, 1.5–5 mm wide, widest at apex extended between lateral wings, entire or irregularly lobed; ventral areole broadly ovate, 4.5–7 × 4–5 mm.

Phenology. Collected with flowers from March to October, and with fruits from June to December.

Ecology and distribution. Northeastern Brazil (Ceará, Paraíba, and Pernambuco), in thickets and woodlands and along streams; no collector has recorded elevations.

Etymology. The epithet *septentrionalis* refers to the fact that this species is distributed to the north of its close sister, *Amorimia rigida*, which differs from it in having the lamina early quite glabrate, the leaf glands mostly more distal, the sepals broadly obtuse to rounded at the apex and appressed in anthesis, the styles dorsally rounded or truncate at the apex, and the ventral areole of the samara narrowly elliptical or ovate, (2–)2.2–3.5 times as long as wide. Also, in *A. rigida* the posterior petal is much more strongly differentiated from the lateral petals than in *A. septentrionalis*, because its claw is notably longer.

Paratypes. BRAZIL. **Ceará**: Maranguape, Hotel Pirapora, *Drouet 2261* (MICH, NY, US); Mun. Maranguape, Açude São Bento, *Drouet 2279* (MICH, US); Várzea Grande, *Luetzelburg 23600* (NY); estrada da Serra do Vicente a Baturité, *Martins & Nunes s.n.* [EAC 8652] (MICH); Serra de Maranguape, *Ule 9040* (US). **Paraíba**: Mun. Ribas, Fazenda Cipoal, *Döbereiner 44* (MICH). **Pernambuco**: Nazaré da Mata, *Coêlho de Moraes 938* (US); Bom Conselho, *Döbereiner & Tokarnia 498* (MO); Tapera, *Pickel 278* (MICH, NY, US) and *Pickel s.n.* (US). **State unknown**: Fazenda Praia, *Döbereiner & Tokarnia 790* (US); S. Gonçalo, *Luetzelburg 27022* (NY).

10. Amorimia velutina W. R. Anderson, sp. nov. TYPE: Brazil. Minas Gerais: Itinga [ca. 16°35′S, 41°47′W], Faz. Timirim (prop. of Dr. Alexandre), 22 Apr. 1985 (fl/fr), *SAP 243* (holotype, mounted on two sheets, MICH).

Liana; caulis annotinus dense et pertinaciter velutinus; petiolus 2–4.5 mm longus; lamina foliorum majorum 5–10 × 3.5–5 mm, elliptica, utrinque dense velutina pilis abaxialibus persistentibus; flores in pseudoracemis 4–20 cm longis 10–50-floris portati; bracteae 3–4(–6) × 1.5–3 mm, patentes, plerumque glanduliferae; petala lutea, utrinque tomentosa vel velutina, margine integro; petala lateralia ungue 1–1.5 mm longo, limbo 3.5–5 × 2.5–3.5 mm; petalum posticum ungue 2–2.7 mm longo, limbo 3–4 × 2.3–3.5 mm; antherae 1.1–1.4 mm longae, basi piliferae; styli apice dorsaliter rotundati vel truncati; samara alis lateralibus discretis, 12–14 mm altis, 10 mm latis, sericeis, integris, ala dorsali 6–7 mm alta, 3–4 mm lata, nuce velutina, areola ventrali ca. 5.5 × 3–3.5 mm.

Vine; stems densely and persistently velutinous in the first year, glabrate in subsequent years. Leaves opposite, subopposite, or alternate on the same stem; petiole 2–4.5 mm long, velutinous to eventually glabrescent, eglandular; lamina of larger leaves 5–10 × 3.5–5 cm, elliptical or slightly obovate, cuneate or rounded at base, acute to rounded at apex, mostly bearing 1(2) small impressed glands on each side of abaxial surface, near middle, set in 1–4 mm from margin, initially densely velutinous on both sides with V-shaped hairs, the hairs eventually deciduous from adaxial surface but persistent on abaxial surface, the lateral veins 4–6 on each side of midrib; stipules 0.7–1.5 mm long, triangular, sericeous to glabrescent

in age, borne on stem at base of petiole, persistent or deciduous. Flowers borne in pseudoracemes 4–20 cm long, containing 10–50 flowers with the flowers sometimes decussate and sometimes in no consistent arrangement, the pseudoracemes axillary or arrayed in lateral or terminal panicles, the axes velutinous; bracts and bracteoles persistent or deciduous late in anthesis or during enlargement of fruits; bracts 3–4(−6) × 1.5–3 mm, lanceolate, ovate, or deltate and often narrowed at base to a short petiole, spreading, usually bearing 1 or 2 small inframarginal to marginal abaxial glands on each side near or below middle, velutinous or appressed-velutinous on both sides; peduncle 1–4 mm long, velutinous; bracteoles 2–2.5 × 1–2 mm, like bracts but smaller and less consistently glanduliferous, borne at apex of peduncle; pedicel 3–5 mm long, velutinous. Sepals ca. 2 mm long and wide, rounded at apex, appressed in anthesis, abaxially densely appressed-velutinous, adaxially sericeous proximally, the abaxial glands 2–2.7 mm long; petals "yellow with an orange median stripe," abaxially densely tomentose or velutinous on claw and limb, adaxially densely tomentose or velutinous on distal half of limb with hairs decurrent on midrib, the limb elliptical, truncate or slightly hastate at base (especially in lateral petals), entire; lateral petals with claw 1–1.5 mm long, limb 3.5–5 × 2.5–3.5 mm; posterior petal with claw 2–2.7 mm long, limb 3–4 × 2.3–3.5 mm; filaments 1.5–2 mm long, connate at base, glabrous; anthers 1.1–1.4 mm long, each half with a basal tuft of hairs, the connective dark red; ovary 1–1.5 mm high, densely appressed-velutinous; styles 1.3–1.7 mm long, cylindrical, initially erect but soon recurved, rounded or truncate dorsally and somewhat flattened laterally at apex, the anterior slenderer and shorter than the posterior 2. Samara (slightly immature?) ca. 2.5 cm wide, butterfly-shaped with the flabellate lateral wings distinct at apex and base, velutinous on nut, loosely sericeous on wings; lateral wings 12–14 mm high, 10 mm wide, entire; dorsal wing 6–7 mm high, 3–4 mm wide, coarsely dentate; ventral areole broadly ovate, ca. 5.5 × 3–3.5 mm.

Phenology. Collected with flowers and fruits in March and April.

Ecology and distribution. Known only from two collections from Minas Gerais, Brazil; in neither case did the collectors record the elevation or habitat.

Etymology. The epithet of this species refers to the persistently velutinous stems and leaves, which immediately distinguish it from the other species in the *Amorimia rigida* complex; those have the stems and leaves sericeous to soon glabrate, or the lamina has some appressed hairs persistent on the abaxial surface. It also differs in the samara; in *A. rigida* the nut is sericeous, the wings are thinly sericeous to glabrate, and the ventral areole is narrower, usually at least 2.2 times as long as wide.

Paratype. BRAZIL. **Minas Gerais**: Entre Itaobim e Jequitinhonha, *Shepherd et al. 4409* (NY).

V. Carolus W. R. Anderson, gen. nov. TYPE: *Carolus chlorocarpus* (A. Jussieu) W. R. Anderson.

Mascagnia sect. *Dipterys* Skottsberg, Kongl. Svenska Vetenskapsakad. Handl. 35(6): 7. 1901. TYPE: *Mascagnia chlorocarpa* (A. Jussieu) Grisebach [= *Carolus chlorocarpus* (A. Jussieu) W. R. Anderson].

Heladena sect. *Hassleria* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 5: 15. 1914. TYPE: *Heladena hassleriana* Niedenzu in Chodat & Hassler [= *Carolus chlorocarpus* (A. Jussieu) W. R. Anderson].

The name of this section was spelled *Halleria* in the protologue. Niedenzu (1928: 582) said that was a typographical error and corrected the spelling to *Hassleria*.

Lianae lignosae; lamina eglandulosa vel margine 2–multis glandulis parvis instructa; stipulae interpetiolares; inflorescentia pseudoracemus, umbella, vel panicula, floribus plerumque decussatis; bracteae bracteolaeque eglandulosae; sepala petalis in alabastro breviora, appressa per anthesin; petala lutea, abaxialiter dense sericea; antherae inter se similares, glabrae vel paucipiliferae; styli stigmate introrso; samara alis lateralibus apice basique usque ad nucem incisis.

Woody vines. Leaves opposite; petiole eglandular or bearing 2–4(–6) small glands; lamina eglandular or bearing 2–many tiny glands on or embedded in margin; stipules very small, triangular, borne on stem between petioles or beside base of petiole, caducous or persistent. Inflorescence axillary or terminal, a pseudoraceme or umbel or a panicle of pseudoracemes or umbels, the flowers mostly decussate; bracts and bracteoles eglandular, persistent; floriferous peduncle often well developed, reduced or lacking in some populations. Sepals shorter than petals in bud and leaving petals exposed during enlargement of bud, appressed in anthesis, all 5 eglandular or the lateral 4 bearing large paired abaxial glands; corolla bilaterally symmetrical, the posterior petal erect and ± different from the spreading lateral 4; petals yellow, abaxially densely sericeous on claw and limb except near margin, adaxially glabrous; stamens 10, all fertile; filaments connate in proximal 1/4–1/2, sometimes subequal but mostly of differing lengths, often longest opposite anterior sepal and shortest opposite posterior petal, the 2 opposite posterior-lateral petals often thicker than others; anthers alike

or subequal, glabrous or sparsely hairy; carpels connate their whole length in ovary; styles erect and straight or somewhat bowed or spreading, alike, dorsally rounded to short-apiculate or short-hooked and laterally compressed or terete at apex, the stigma internal. Fruit dry, breaking apart into samaras separating from a high pyramidal torus; samara butterfly-shaped with lateral wings dominant, chartaceous with many fine parallel veins, cleft to nut at base and apex, the margin sinuate to coarsely dentate; dorsal wing(s) lacking or, if developed, small, distinct at base and apex; ventral areole ovate to linear; samara reduced or highly modified in some populations of *Carolus sinemariensis*.

I am happy to name this genus in honor of my friend and colleague, Charles Cavender Davis (b. 1974), whose molecular studies have already made a substantial contribution to our understanding of the systematics of the Malpighiaceae.

Carolus is distinguished by its interpetiolar stipules, marginal leaf glands, densely sericeous yellow petals, and butterfly-shaped samaras. Because they both have interpetiolar stipules and hairy yellow petals, this genus can be confused with *Amorimia*, but that genus differs in having its leaf glands usually on the abaxial surface between the midrib and the margin, and in its large spreading gland-bearing bracts. *Aenigmatanthera* is readily distinguished from *Carolus* by its epipetiolar stipules, glabrous or subglabrous petals, and anthers densely sericeous on the connective. In previously published molecular studies (Cameron et al., 2001; Davis et al., 2001, 2002), *Carolus* was represented by *C. chasei* (W. R. Anderson) W. R. Anderson (as *Mascagnia chasei* W. R. Anderson). The best-resolved of those trees is that in Davis et al. (2002) in which *C. chasei* was placed in a clade comprising *Dicella* Grisebach, *Tricomaria* Hooker & Arnott, *Heteropterys*, *Hiptage* Gaertner, and *Niedenzuella* (as *Mascagnia stannea* (Grisebach) Niedenzu). That clade had no bootstrap support, nor did the position of *Carolus* in it. The only one of those genera that has butterfly-shaped samaras is *Niedenzuella*, which has long, imbricated sepals that conceal the petals in the enlarging bud.

Carolus comprises six species of Mexico, Central America, the Lesser Antilles, and South America.

Key to the Species of *Carolus*

1a. Lamina abaxially densely and persistently sericeous at maturity.
  2a. Flowers borne ultimately in ± elongated pseudoracemes of 4–20, with internodes developed between pairs of flowers and the pairs ± evenly distributed; eastern Brazil.
    3a. Lamina up to 7 × 3.5 cm, mostly smaller; inflorescence an unbranched axillary pseudoraceme; samara smooth between lateral wings, the dorsal winglet completely lacking or represented at most by a rounded hump at apex; anthers glabrous, the connective brownish . . . . . 2. *C. chasei*
    3b. Lamina of larger leaves mostly at least 9 × 4 cm, often larger; inflorescence usually compound, an axillary or terminal panicle of pseudoracemes; samara bearing between lateral wings ca. 5 parallel ± dissected winglets 1–2.5 mm wide; anthers bearing a few hairs on locules, the connective black. . 5. *C. renidens*
  2b. Flowers borne ultimately in umbels of 4(–6); Panama and Pacific South America.
    4a. Samara with a well-developed rectangular or triangular dorsal wing between lateral wings, (2–)3–7 mm wide; styles dorsally short-apiculate at apex; peduncles 1–2.5 mm long; Pacific Ecuador and Peru . . . . . 1. *C. anderssonii*
    4b. Samara nearly smooth between lateral wings, the dorsal wing represented only by a longitudinal rib and a triangular winglet up to 1.5 mm high and wide at apex; styles with a dorsal hook at apex; peduncles mostly lacking, occasionally up to 0.5 mm long; Panama . . . 4. *C. dukei*
1b. Lamina abaxially glabrous or glabrate at maturity, rarely thinly sericeous or appressed-tomentose with the hairs never dense enough to completely hide epidermis.
  5a. Flowers borne in ± elongated pseudoracemes of 6–14(–20), with internodes between pairs of flowers longer than peduncles and the pairs ± evenly distributed; South America south of the Amazon, from Bolivia and Paraguay to southeastern Brazil . . . . . 3. *C. chlorocarpus*
  5b. Flowers crowded distally in umbels, corymbs, or dense pseudoracemes of 4–8(–12) with internodes between pairs of flowers lacking or very short, mostly shorter than peduncles; Mexico to South America north of 4°S, and Lesser Antilles . . . . . 6. *C. sinemariensis*

1. Carolus anderssonii (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia anderssonii* W. R. Anderson, Contr. Univ. Michigan Herb. 22: 15. 1999. TYPE: Ecuador. Loja: near Malacatos, *G. Harling & L. Andersson 21477* (holotype, GB; isotype, US).

This species is known from Pacific Ecuador and Peru (Anderson, 1999: 16).

2. Carolus chasei (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia chasei* W. R. Anderson, Contr. Univ. Michigan Herb. 19: 378. 1993. TYPE: Brazil. Bahia: S of Maracás, *T. S. dos Santos et al. 3480* (holotype, CEPEC; isotypes, MICH, NY).

3. Carolus chlorocarpus (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea chlorocarpa* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 259. 1840. *Mascagnia chlorocarpa* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 93. 1858. TYPE: Brazil. Region of Rio de Janeiro, *Vauthier [21]* (lectotype, designated by Anderson (1993: 379), P [F neg. 35628]; duplicates, G, K, P).

Heladena hassleriana Niedenzu in Chodat & Hassler, Bull. Herb. Boissier, Sér. 2, 7: 294. 1907. TYPE: Paraguay. Río Apa, *E. Hassler 7837* (lectotype, designated here, G; isotypes, A, BM, G, K, LIL, MICH, MO, NY, P).

The sole type collection was *Hassler 7837*, but because the holotype in B was destroyed it is necessary to designate one of the many isotypes as lectotype. I have selected one of the six sheets at G, the one annotated by Niedenzu in 1907; four of the others were not annotated by Niedenzu, and the fifth was not annotated by him until 1910.

Carolus chlorocarpus is known from Bolivia (*Gentry et al. 73882*, MICH) and Paraguay to southeastern Brazil.

4. Carolus dukei (Cuatrecasas & Croat) W. R. Anderson, comb. nov. Basionym: *Mascagnia dukei* Cuatrecasas & Croat, Ann. Missouri Bot. Gard. 67: 908. 1980 [1981]. TYPE: Panama. Panamá: between Cañasas and Sabalo, *J. Duke 14468* (holotype, US; isotypes, MO, PMA not seen).

5. Carolus renidens (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea renidens* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 260. 1840. *Tetrapterys renidens* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 68. 1858. *Mascagnia renidens* (A. Jussieu) W. R. Anderson, Contr. Univ. Michigan Herb. 15: 136. 1982. TYPE: Brazil. Sebastianópolis [Rio de Janeiro], *Vauthier 450* (lectotype, designated here, P [MICH, WRA negs. 81-22-30 & 31]; isotypes, G, L, P).

Vauthier 450 was the single type collection. It is represented at P by three sheets, of which I have selected as lectotype the best, most representative specimen, which was annotated by Jussieu.

Hiraea cinerea Bunbury, Proc. Linn. Soc. London 1: 109. 1841. TYPE: Brazil. Rio de Janeiro, Corcovado, *C. Bunbury s.n.* (holotype, CGE not seen; isotypes, BR not seen, K not seen).

The name *Mascagnia metallicolor* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 20. 1908, has been widely used for this plant (Niedenzu, 1928: 111). It is a superfluous synonym for *Hiraea cinerea*, because Niedenzu cited Bunbury's collection as his type.

Hiraea heteropetala A. Jussieu, Arch. Mus. Hist. Nat. 3: 557. 1843. *Tetrapterys heteropetala* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 88. 1858. TYPE: Brazil. *P. Claussen 33* (lectotype, designated here, P [F neg. 35603]).

As syntypes Jussieu cited Clausen and Sellow collections from Brazil, without numbers or detailed localities. In B there was a Sellow collection annotated by Jussieu (F. neg. 12731). In P there are two Clausen sheets, 33 and 77, both representing this species. Only *Clausen 33* was annotated by Jussieu, for which reason that specimen is designated lectotype.

Banisteria riedeliana Regel, Index Sem. Horti Bot. Petropol. 17. 1855. *Mascagnia riedeliana* (Regel) W. R. Anderson, Contr. Univ. Michigan Herb. 14: 21. 1980. TYPE: Cultivated in Hort. Petropol. from seeds sent by L. Riedel, from the base of Corcovado, Rio de Janeiro, Brazil (holotype, LE).

6. Carolus sinemariensis (Aublet) W. R. Anderson, comb. nov. Basionym: *Banisteria sinemariensis* Aublet, Hist. Pl. Guiane 1: 162. 1775. *Mascagnia sinemariensis* (Aublet) Grisebach in Martius, Fl. Bras. 12(1): 93. 1858. TYPE: French Guiana. *J. Aublet s.n.* (holotype, BM). Figure 7.

Malpighia volubilis Sims, Bot. Mag. 21: 809. 1805. *Byrsonima volubilis* (Sims) DC., Prodr. 1: 581. 1824. *Banisteria volubilis* (Sims) Endlicher, Cat. Horti Vindob. 2: 375. 1842. *Mascagnia volubilis* (Sims) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 22. 1908. TYPE: Cultivated, from West Indies (holotype, K).

Hiraea schizoptera Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 36: 584. 1863. *Mascagnia schizoptera* (Turczaninow) Cuatrecasas, Webbia 13: 373. 1958. TYPE: St. Vincent, *G. Caley s.n.* (holotype, KW not seen; isotype, G).

Diplopterys microcarpa Sandwith, Kew Bull. 1931: 183. 1931. *Mascagnia microcarpa* (Sandwith) W. R. Anderson, Mem. New York Bot. Gard. 32: 220. 1981. TYPE: Guyana, Essequibo: Moraballi Creek near Bartica, *N. Sandwith 289* (holotype, K; isotype, NY).

Mascagnia hondensis C. V. Morton, Proc. Biol. Soc. Wash. 45: 52. 1932. TYPE: Colombia, Tolima: Honda, *Bro. Ariste Joseph 1371* (holotype, US).

This species is interpreted very broadly here. In that sense, it is known from Mexico (*Wilbur & Wilbur 2394*, MICH) to South America north of 4° S, and the Lesser Antilles.

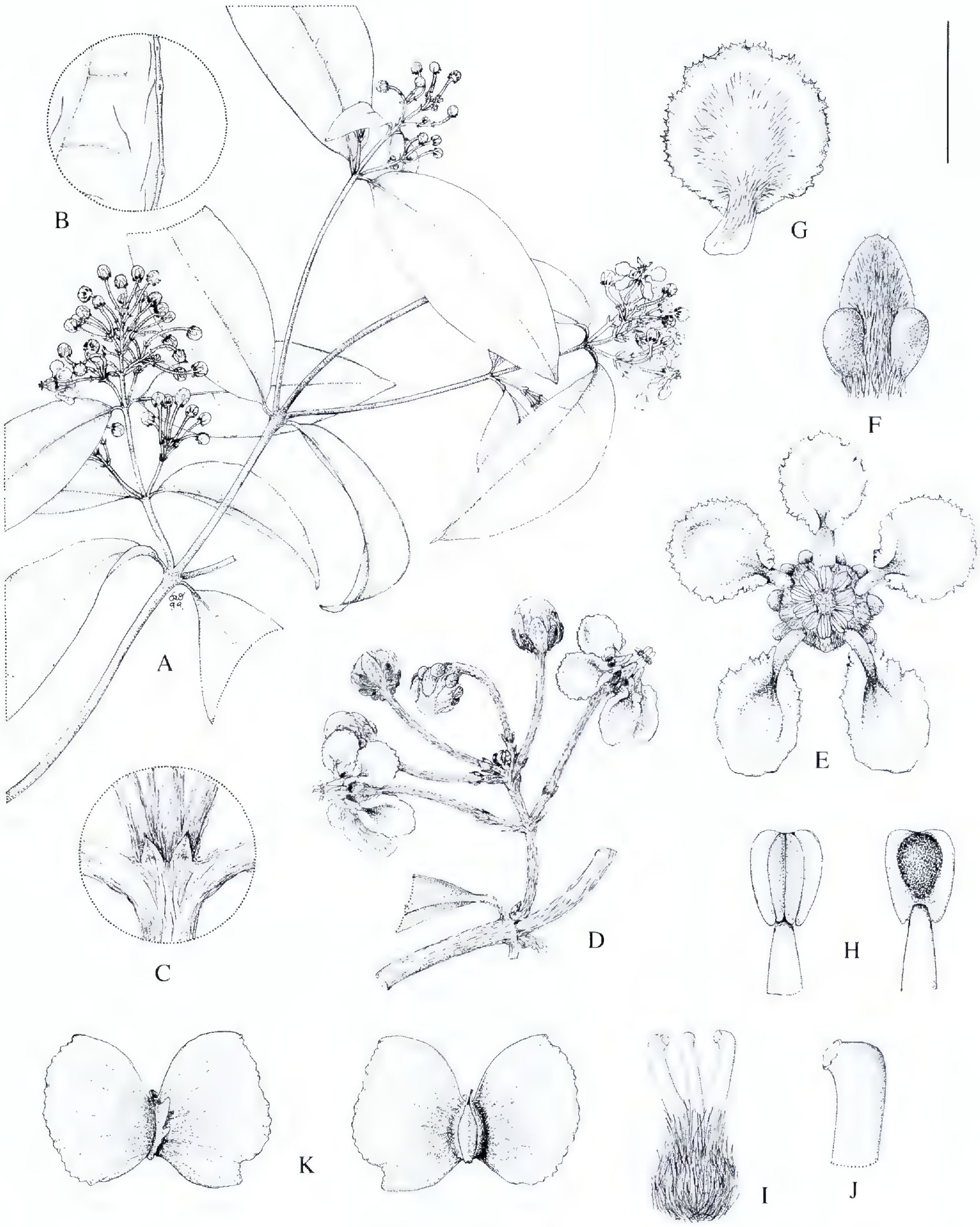

Figure 7. *Carolus sinemariensis* (Aublet) W. R. Anderson. —A. Flowering branch. —B. Abaxial margin of lamina. —C. Node with stipules. —D. Axillary inflorescence. —E. Flower, posterior petal uppermost. —F. Lateral sepal, abaxial view. —G. Lateral petal, abaxial view. —H. Anther, adaxial view (left) and abaxial view (right). —I. Gynoecium. —J. Apex of style. —K. Samara, abaxial view (left) and adaxial view (right). Scale bar equivalents: A, 4 cm; B & C, 4 mm; D, 1.3 cm; E, 7 mm; F, 2.7 mm; G, 4 mm; H, 2 mm; I, 2.7 mm; J, 1.3 mm; K, 2 cm. A–J, *Wilbur & Wilbur 2394* (MICH); K, *Cochrane et al. 12331* (MICH).

VI. Christianella W. R. Anderson, gen. nov. TYPE: *Christianella mesoamericana* (W. R. Anderson) W. R. Anderson.

Lianae lignosae vel frutices; lamina eglandulosa vel in dimidio proximali aliquot glandulis parvis marginalibus instructa; stipulae parvae prope basim petioli portatae; bracteae bracteolaeque eglandulosae vel glandulis parvis marginalibus instructae; bracteolae apice pedunculi portatae; sepala aliquot glandulis parvis marginalibus instructa, his sessilibus, subsessilibus, vel stipitatis; petala lutea, abaxialiter tomentosa; filamenta valde heteromorpha; samara membranacea, alis lateralibus apice distinctis, basi continuis vel usque ad nucem incisis.

Woody vines, or shrubby in open habitats. Petiole eglandular or bearing 2–10 large to small glands in 2 rows; lamina eglandular or bearing several small sessile glands on margin on proximal half; stipules very small, triangular, borne on petiole near base. Inflorescence with flowers decussate to irregularly inserted in short to elongated pseudoracemes, terminal or lateral, single or (usually) grouped in panicles; bracts and bracteoles eglandular or bearing several subsessile to long-stalked, clavate or capitate marginal glands; floriferous peduncle well developed; bracteoles borne at apex of peduncle. Sepals elongated but separating to expose petals during enlargement of bud, appressed to spreading in anthesis, the lateral 4 bearing large paired abaxial glands, all 5 bearing a row of small sessile or subsessile to long-stalked, clavate or capitate marginal glands; corolla bilaterally symmetrical, the posterior petal with a longer and thicker claw than the lateral 4; petals yellow, abaxially densely tomentose, adaxially glabrous; androecium bilaterally symmetrical; stamens 10, all fertile, glabrous; filaments connate at base, straight, strongly heteromorphic, longest and much thickened opposite the 2 posterior-lateral petals, usually long but slender opposite the anterior sepal, shortest opposite the posterior petal; anthers subequal or larger on longer filaments; gynoecium bilaterally symmetrical; carpels very shortly connate in ovary; anterior style straight and shorter than the others, the posterior 2 straight or bowed from the base; apex of styles dorsally truncate to short-hooked, the stigma internal. Fruit dry, breaking apart into samaras separating from a short obscure pyramidal torus; samara suborbicular to butterfly-shaped, the lateral wing(s) dominant, membranous with reticulate-anastomosing venation, cleft to nut at apex, continuous at base or cleft to nut, bearing stiff, usually basifixed or sub-basifixed hairs inserted at dark spots, the margin undulate or coarsely dentate; dorsal wing small, extended forward at apex through gap in lateral wing, distinct at base or confluent with lateral wing; intermediate winglets mostly lacking, rarely 1, narrow; ventral areole circular or broadly ovate.

It gives me great pleasure to name this genus in honor of Christiane Eva Seidenschnur Anderson (b. 1944). Christiane's excellent revisions in the Malpighiaceae and her achievements as editor of *Systematic Botany Monographs* have made her an important figure in our generation of plant taxonomists.

Christianella is distinguished by the small glands found on the margin of the sepals, and in most species on the margin of the bracteoles and sometimes the bracts. Such marginal glands are found in a few other genera of Malpighiaceae, but not in any of the other groups included in *Mascagnia* by Niedenzu. This group of species is also notable for the marginal leaf glands, the yellow abaxially tomentose petals, the heteromorphic filaments, and the membranous samaras with the lateral wings cleft to the nut at the apex and continuous or cleft at the base. The stiff hairs on the samara wings are usually inserted at characteristic dark spots. *Christianella* has not been included in any published molecular study.

Christianella consists of five species of Central and South America.

Key to the Species of *Christianella*

1a. Lamina sericeous to soon glabrate, the hairs sessile and straight.
  2a. Bracts and bracteoles 2–3 mm long, eglandular or with several tiny sessile or subsessile marginal glands; marginal glands of sepals sessile or subsessile; southwestern Brazil . . . . . 1. *C. paludicola*
  2b. Bracts and bracteoles 3–7 mm long, with many long-stalked marginal glands; marginal glands of sepals long-stalked.
    3a. Bracts caducous; petiole of larger leaves 11–15 mm long; lamina of larger leaves 5–7.2 cm wide; samaras orbicular, 35–60 mm wide, the lateral wing continuous at base, cleft to nut at apex; western Amazonia . . . . . 1. *C. glandulifera*
    3b. Bracts persistent or deciduous in fruit; petiole of larger leaves 2–8 mm long; lamina of larger leaves 2.5–5 cm wide; samaras butterfly-shaped, 22–42 mm wide, the lateral wing cleft to nut at base and apex; southeastern Mexico to Panama . . . . . 2. *C. mesoamericana*
1b. Lamina densely and persistently tomentose, velutinous, or woolly, especially abaxially, the hairs stalked.
  1a. Peduncle and pedicel very deeply woolly, 1–1.5 mm or more diam. including vesture; hairs so dense on abaxial leaf surface as to make it difficult to distinguish the crosspiece of any given hair; bracteoles abaxially very densely spreading-woolly, adaxially tomentose, at least on the distal half; sepals abaxially deeply spreading-woolly; petals abaxially densely

woolly; southern Bolivia, northern Paraguay, and southern Brazil . . . 3. *C. multiglandulosa*

4b. Peduncle and pedicel densely tomentose or velutinous but only 0.4–0.7 mm diam. including vesture; leaf hairs much less dense, the crosspieces of individual hairs easily distinguished; bracteoles abaxially appressed-tomentose, adaxially glabrous or tomentose only at very apex; sepals abaxially appressed-tomentose or subsericeous; petals abaxially moderately appressed-tomentose; Amazonian South America . . . 5. *C. surinamensis*

1. **Christianella glandulifera** (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Mascagnia glandulifera* Cuatrecasas, Webbia 13: 365. 1958. TYPE: Colombia. Amazonas-Vaupés: Río Apaporis, *R. E. Schultes & I. Cabrera 13208* (holotype, US; isotypes, GH, NY).

2. **Christianella mesoamericana** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia mesoamericana* W. R. Anderson, Contr. Univ. Michigan Herb. 16: 105. 1987. TYPE: Guatemala. Retalhuleu: Between Retalhuleu and Nueva Linda, *P. C. Standley 87301* (holotype, F; isotype, US).

This species is known from southeastern Mexico, Guatemala, and Panama (Anderson, 1987: 105), and has recently been found in Costa Rica (*Acosta 803*, INB).

3. **Christianella multiglandulosa** (Niedenzu in Chodat & Hassler) W. R. Anderson, comb. nov. Basionym: *Mascagnia multiglandulosa* Niedenzu in Chodat & Hassler, Bull. Herb. Boissier, Sér. 2, 7: 284. 1907. TYPE: Paraguay. Near Valenzuela, *E. Hassler 6998* (lectotype, designated here, G; isotypes, A, G, K, MO, NY).

The holotype sheet of *Hassler 6998* was destroyed at B. There are four isotypes at G; the lectotype is the isotype that was annotated lectotype by W. R. Anderson in 1993.

This species is known from Paraguay and southern Brazil (Anderson 1990b: 53) and southern Bolivia (*Gutiérrez et al. 1170*, MICH).

4. **Christianella paludicola** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia paludicola* W. R. Anderson, Contr. Univ. Michigan Herb. 16: 106. 1987. TYPE: Brazil. Amazonas: Rio Purús, Rio Ituxi, *G. T. Prance et al. 13918* (holotype, INPA; isotypes, K, MICH, MO, NY, U, US, VEN).

5. **Christianella surinamensis** (Kostermans) W. R. Anderson, comb. nov. Basionym: *Mascagnia multiglandulosa* var. *surinamensis* Kostermans, Meded. Bot. Mus. Herb. Rijksuniv. Utrecht 25: 5. 1936. *Mascagnia surinamensis* (Kostermans) W. R. Anderson, Contr. Univ. Michigan Herb. 17: 53. 1990. TYPE: Suriname. Brownsberg, 23 Sep. 1931, *W. C. v. Emden* (holotype, U; isotypes, K, MICH). Figure 8.

This species is widespread in Amazonian South America, including Guyana and Suriname (Anderson 1990b: 53).

VII. Malpighiodes Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 31. 1909. *Tetrapterys* subsect. *Malpighiodes* (Niedenzu) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 12. 1912. LECTOTYPE: *Malpighiodes spruceana* Niedenzu [= *Malpighiodes bracteosa* (Grisebach in Martius) W. R. Anderson]. Brazil, Amazonas: "in vicinibus Barra [Manaus], prov. Rio Negro, coll. R. Spruce Dec.–Martius 1850–51," *R. Spruce [1093]* (lectotype, designated here, M).

Woody vines. Petiole eglandular or bearing 2–8 small glands in 2 rows; lamina usually bearing few to many small glands impressed in abaxial surface in 1–3 rows between midrib and margin; stipules minute, triangular, borne on proximal half of petiole or at junction of petiole and stem, or apparently lacking. Inflorescence a terminal or lateral compound dichasium or paniculate dichasium, strictly decussate, with the flowers borne in pairs or umbels or corymbs of 4(–8); floriferous peduncle well developed; bracteoles eglandular, broad and rounded (elliptical or obovate), 2.5–4 mm long, borne between middle and apex of peduncle. Sepals valvate, completely concealing petals during enlargement of bud, revolute in anthesis, all 5 biglandular; corolla bilaterally symmetrical, the posterior petal somewhat different from lateral 4; petals yellow turning red in age, glabrous; stamens 10, all fertile; filaments ca. 1/2-connate, straight, those opposite sepals slightly longer than those opposite petals; anthers alike, glabrous; carpels completely connate in ovary; styles ± straight, subequal, stout, truncate at apex with the stigma terminal or nearly so. Fruit dry, breaking apart into samaras separating from a prominent pyramidal torus (in *Malpighiodes bracteosa* the mericarps with the wings reduced to coriaceous or corky outgrowths); samara suborbicular or transversely elliptical, the lateral wing, if developed, dominant, membranous with many looping anastomoses, cleft to nut at apex, continuous at base, the margin entire, undulate, or coarsely toothed; dorsal wing small, free

Figure 8. *Christianella surinamensis* (Kostermans) W. R. Anderson. —A. Flowering branch. —B. Node enlarged to show stipules and gland on petiole. —C. Edge of abaxial surface of lamina, to show marginal glands. —D. Portion of the inflorescence. —E. Flower bud with bracteoles and bract. —F. Flower, lateral view, posterior petal uppermost. —G. Posterior petal, abaxial view. —H. Androecium laid out, abaxial view, stamen opposite posterior petal third from left. —I. Gynoecium, anterior style in center. —J. Apex of style. —K. Samara, abaxial view (above) and adaxial view (below). —L. Single hair from samara. Scale bar equivalents: A, 4 cm; B, 1 cm; C, 4 mm; D, 2 cm; E, 4 mm; F, 8 mm; G, 4 mm; H & I, 2.7 mm; J, 0.8 mm; K, 2 cm; L, 2 mm. A–C, *Maguire et al. 56605* (MICH); D & E, *Stoffers et al. 273* (MICH); F–J, *Plowman 13721* (MICH); K & L, *Silva 1218* (MICH).

from lateral wing at base, extended forward at apex through gap in lateral wing; intermediate winglets none or 1–several seta-like structures as high as width of dorsal wing or smaller; ventral areole broadly ovate.

The name *Malpighiodes* refers to a resemblance Niedenzu saw between the reduced fruits of *Malpighiodes bracteosa* and the fruits of *Malpighia* (Niedenzu, 1908: 18). That fruit is quite different from the membranous samaras of *Malpighiodes guianensis* (W. R. Anderson) W. R. Anderson and *Malpighiodes leucanthele* (Grisebach in Martius) W. R. Anderson (the fruits of *Malpighiodes liesneri* (W. R. Anderson) W. R. Anderson are not known), but many other shared character-states tie these four species together into a coherent group. Among those similarities are the glands embedded in the abaxial leaf surface, dichasial inflorescence with decussate flowers, large rounded bracteoles, long valvate biglandular sepals concealing the petals in bud and revolute in anthesis, glabrous yellow petals turning red in age, and terminal or subterminal stigmas. In Davis et al. (2002), this genus (represented by *Mascagnia bracteosa* Grisebach in Martius) was placed with 90% bootstrap support as sister to a clade containing *Alicia anisopetala* and *Callaeum septentrionale* (A. Jussieu) D. M. Johnson. The suite of characters given above immediately distinguishes *Malpighiodes* from those two genera.

The name *Malpighiodes* was introduced in a footnote (Niedenzu, 1908: 18). In that publication the diagnosis was so minimal as to be unacceptable and no species or combinations were proposed, so even though it is clear that Niedenzu intended to publish a generic name I consider it not to have been validly published in 1908. A year later (Niedenzu, 1909: 31), he gave an expanded diagnosis and published three species; I am accepting that as the valid publication of the name *Malpighiodes*.

Malpighiodes comprises four species of northern South America.

Key to the Species of *Malpighiodes*

1a. Abaxial leaf hairs sessile, straight, appressed.
  2a. Hairs on lateral axes of inflorescence straight to twisted, loose, mostly white; bracts and bracteoles densely white-tomentose on both sides; bracteoles borne at apex of peduncle; fruit unknown; Amazonas, Venezuela . . . . . 4. *M. liesneri*
  2b. Hairs on inflorescence axes straight, appressed, mostly golden; bracts and bracteoles densely sericeous on abaxial side, thinly sericeous on adaxial side; bracteoles borne at or somewhat below apex of peduncle; mericarp wings coriaceous and rudimentary; vicinity of Manaus, Amazonas, Brazil . . . . . 1. *M. bracteosa*
1b. Abaxial leaf hairs stalked, the branches straight or serpentine and often ascending.
  3a. Mature leaves very densely and persistently tomentose below; petiole usually biglandular near middle; filaments abaxially sparsely sericeous; Guyana, Suriname, and French Guiana . . . . . 2. *M. guianensis*
  3b. Mature leaves glabrate or thinly hispid below; petiole eglandular; filaments glabrous; western Amazonas, Brazil . . . . . 3. *M. leucanthele*

1. Malpighiodes bracteosa (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia bracteosa* Grisebach in Martius, Fl. Bras. 12(1): 97. 1858. *Hiraea bracteosa* (Grisebach in Martius) Sagot, Ann. Sci. Nat. Bot., Sér. 6, 12: 187. 1881. *Malpighiodes spruceana* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 31. 1909. *Diplopterys bracteosa* (Grisebach in Martius) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 20. 1912. *Diplopterys spruceana* (Niedenzu) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 21. 1912. *Jubelina bracteosa* (Grisebach in Martius) Cuatrecasas, Webbia 13: 446. 1958. *Mascagnia heterocarpa* W. R. Anderson, Mem. New York Bot. Gard. 32: 216. 1981, replacement name for *Malpighiodes spruceana* Niedenzu, non *Mascagnia spruceana* Niedenzu. TYPE: Brazil. Amazonas: vic. of Barra [Manaus], *R. Spruce [1093]* (lectotype, designated by Anderson (1990a: 31), M; duplicates, BM, CGE, E, G, GH, K, LE, NY). Figure 9J.

See Anderson, 1990a: 31, for a discussion of the lectotypification of *Mascagnia bracteosa*. The M sheet that was designated in 1990 as lectotype of that name is designated above as lectotype of *Malpighiodes spruceana*, the type of the genus.

2. Malpighiodes guianensis (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia guianensis* W. R. Anderson, Mem. New York Bot. Gard. 32: 213. 1981. TYPE: Guyana. Rockstone, *H. A. Gleason 825* (holotype, NY; isotypes, K). Figure 9A–I.

This species is known from Guyana, Suriname, and French Guiana (Anderson, 1981: 215).

3. Malpighiodes leucanthele (Grisebach in Martius) W. R. Anderson, comb. nov. Basionym: *Mascagnia leucanthele* Grisebach in Martius, Fl. Bras. 12(1): 96. 1858. TYPE: Brazil. Amazonas: between Barcelos and São Gabriel, *R. Spruce [2070]* (isotypes, BM, K, M).

The holotype is not in GOET (J. Heinrichs, pers. comm.). If Grisebach annotated any of the isotypes, that should be considered the holotype.

4. **Malpighiodes liesneri** (W. R. Anderson) W. R. Anderson, comb. nov. Basionym: *Mascagnia liesneri* W. R. Anderson, Contr. Univ. Michigan Herb. 17: 51. 1990. TYPE: Venezuela. Amazonas: San Carlos de Río Negro, *R. Liesner 9063* (holotype, MO; isotypes, MICH, VEN).

VIII. Niedenzuella W. R. Anderson, gen. nov. TYPE: *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson.

Hiraea sect. *Hiraeanthele* Grisebach, Linnaea 13: 239. 1839. *Tetrapterys* sect. *Hiraeanthele* (Grisebach) C. V. Morton, Taxon 17: 322. 1968. TYPE: *Hiraea multiflora* Grisebach [= *Niedenzuella lucida* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 322)).

Tetrapterys sect. *Stenantaeris* Grisebach, Linnaea 13: 235. 1839. TYPE: *Tetrapterys acutifolia* Cavanilles [= *Niedenzuella acutifolia* (Cavanilles) W. R. Anderson] (lectotype, designated by Morton (1968: 322)).

Tetrapterys subsect. *Isopterae* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 262. 1840. TYPE: *Tetrapterys fraxinifolia* A. Jussieu [= *Niedenzuella acutifolia* (Cavanilles) W. R. Anderson] (lectotype, designated by Morton (1968: 321)).

Hiraea sect. *Trilophopterys* Grisebach, Linnaea 22: 24. 1849. TYPE: *Hiraea poeppigiana* A. Jussieu [= *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 322)).

Tetrapterys sect. *Schizopterys* Grisebach in Martius, Fl. Bras. 12(1): 87. 1858. *Tetrapterys* subsect. *Schizopterys* (Grisebach in Martius) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 20. 1909. *Tetrapterys* ser. *Schizopterys* (Grisebach in Martius) Niedenzu in Engler, Pflanzenr. IV, 141: 183. 1928. TYPE: *Tetrapterys poeppigiana* (A. Jussieu) Grisebach in Martius [= *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 323)).

Niedenzu (1928: 183) used the name *Tetrapterys* sect. *Microphyllaris* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 20. 1909; that name is a superfluous synonym of *Tetrapterys* sect. *Schizopterys*.

Tetrapterys subg. *Architetrapterys* Niedenzu in Engler & Prantl, Nat. Pflanzenfam. III, 4: 57. 1890. TYPE: *Tetrapterys poeppigiana* (A. Jussieu) Grisebach in Martius [= *Niedenzuella poeppigiana* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 323)).

Tetrapterys subsect. *Isopterys* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 22. 1909. *Tetrapterys* ser. *Isopterys* (Niedenzu) Niedenzu in Engler, Pflanzenr. IV, 141: 184. 1928. TYPE: *Tetrapterys multiflora* (Grisebach) A. Jussieu [= *Niedenzuella lucida* (A. Jussieu) W. R. Anderson] (lectotype, designated by Morton (1968: 321)).

Lianae lignosae, interdum frutescentes; lamina margine glandulis parvis instructa vel eglandulosa; stipulae parvae epipetiolares, interdum absentes; inflorescentia panicula ex pseudoracemis 2–30-floris floribus plerumque decussatis constans; sepala tenuia, imbricata, petala + tegentia in alabastro, per anthesin revoluta; petala flava, glabra vel abaxialiter parce sericea; filamenta basi connata, recta, inter se ± aequalia; antherae glabrae vel sparsim sericeae, inter se aequales; carpella basi connata in ovario, distaliter distincta; styli recti et erecti vel recurvati, stigmate introrso vel paene terminali, apice dorsaliter rotundati vel truncati; samara alis lateralibus evolutis vel + rudimentariis, usque ad nucem apice basique incisis, quoque dimidio trapezoideo dentato vel lobato vel usque ad nucem inciso.

Woody vines, sometimes shrubby. Petiole eglandular or bearing 2–4 or more glands; lamina eglandular or bearing few to many small glands on margin; stipules very small, triangular or subulate, borne on petiole at base or distally, as high as middle of petiole, persistent, sometimes lacking. Inflorescence a terminal or lateral panicle with the ultimate branches short pseudoracemes containing 2–30 flowers, the flowers mostly strictly decussate, occasionally subopposite distally; floriferous bracts eglandular or biglandular; floriferous peduncle lacking or short to long; bracteoles borne at apex of peduncle or slightly below, usually eglandular, rarely bearing 1 or 2 small abaxial glands. Sepals long and imbricated, mostly concealing petals throughout enlargement of bud (separating to expose petals in bud in a few species), thin and membranous toward margin, revolute in anthesis, the lateral 4 abaxially biglandular and the anterior eglandular or all 5 eglandular; corolla bilaterally symmetrical to nearly radial, the posterior petal with its claw usually somewhat longer or thicker than the 4 lateral petals; petals small, bright yellow, glabrous or abaxially thinly sericeous, erose or subentire; androecium radially symmetrical or nearly so; stamens 10, all fertile; filaments connate at base, straight, alike or the 2 opposite the posterior-lateral petals thicker than others, glabrous or abaxially sericeous; anthers ± alike, glabrous or sericeous; carpels connate at base in ovary, distally distinct; styles stout, straight and erect to distally spreading or recurved, with large internal to nearly terminal stigmas, dorsally rounded or truncate at apex. Fruit dry, breaking apart into samaras or all wings more or less reduced or rudimentary and replaced by crests or irregular outgrowths, the mericarps separating from a flat or short-pyramidal torus; samara (when not reduced) butterfly-shaped or X-shaped, the lateral wings dominant, chartaceous with many fine strongly parallel veins, cleft to nut at apex and base, each side trapezoidal with the margin

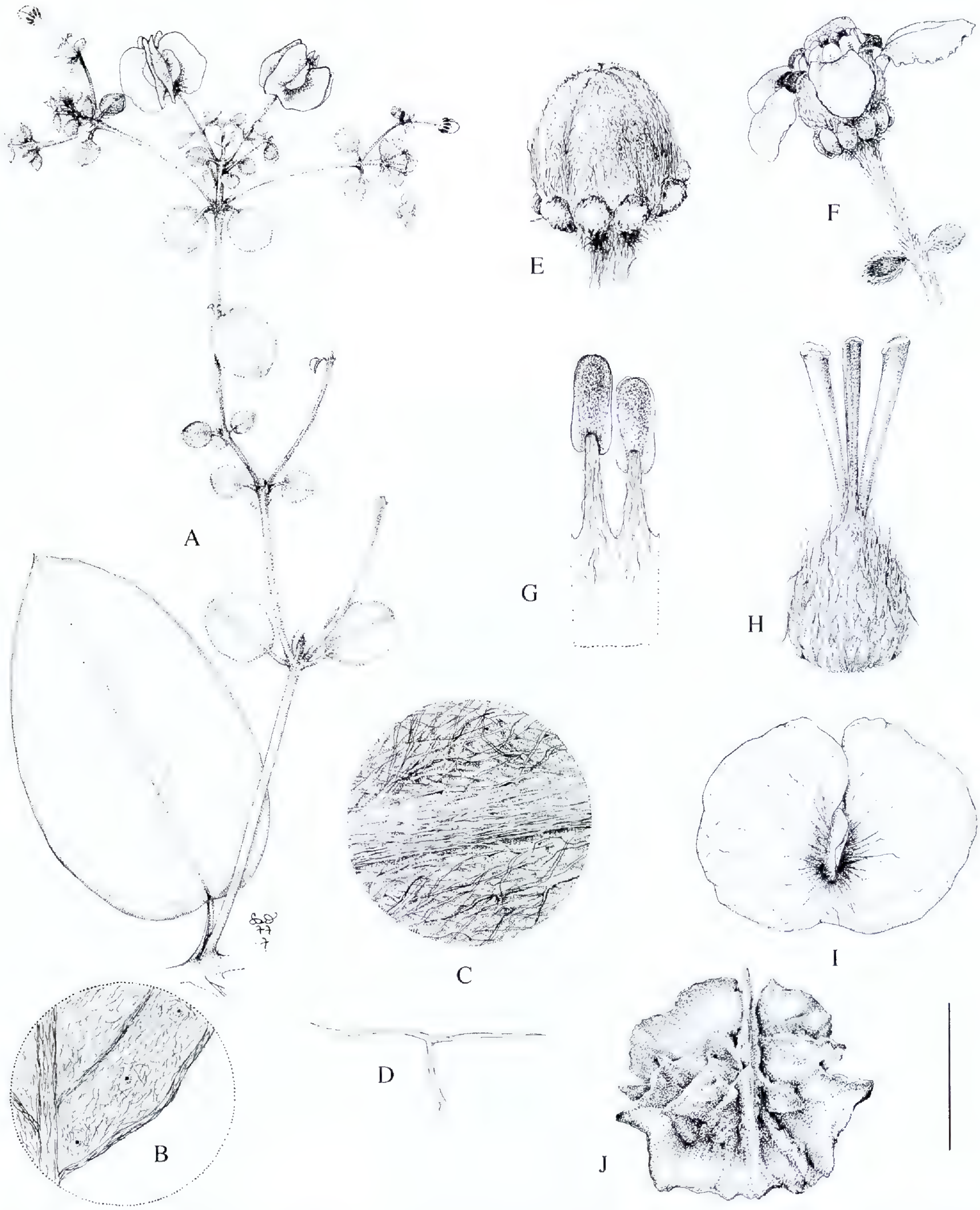

Figure 9. A–I. *Malpighiodes guianensis* (W. R. Anderson) W. R. Anderson. —A. Flowering and fruiting branch. —B. Abaxial base of lamina to show glands. —C. Abaxial surface of lamina. —D. Detached hair from abaxial surface of lamina. —E. Flower bud. —F. Flower, posterior petal to the right. —G. Stamens, abaxial view, the stamen on left opposite a sepal. —H. Gynoecium. —I. Samara, abaxial view. —J. *Malpighiodes bracteosa* (Grisebach in Martius) W. R. Anderson. Mericarp, abaxial view. Scale bar equivalents: A, 3 cm; B, 8 mm; C, 1 mm; D, 0.6 mm; E, 3 mm; F, 6 mm; G & H, 2 mm; I, 2 cm; J, 1 cm. A, C, D & I, *Gleason 825* (NY); B & G, *Cremers 8143* (MICH); E, F & H, *Forest Dept. 3644* (NY); J, *Ducke 1169* (NY). Modified from a drawing by Karin Douthit and originally published in Memoirs of the New York Botanical Garden 32: 214. 1981.

coarsely toothed or sometimes deeply and irregularly lobed, or divided to the nut into 2 elongated, ± parallel-sided wings; dorsal wing or crest small, distinct from lateral wings, often extended forward at apex between lateral wings; irregular outgrowths present between dorsal and lateral wings in some species; ventral areole ovate.

The name *Niedenzuella* honors the memory of Franz Josef Niedenzu (1857–1937), who was the second specialist (following Adrien de Jussieu) to monograph the entire family Malpighiaceae. Niedenzu has had his critics, but his 1928 treatment of the family in *Das Pflanzenreich* remains an essential reference. He was never able to study the plants in the field, had very little material from some areas, and never got the opportunity to visit several critically important herbaria, especially those in Paris and London. Given those limitations, he did amazingly well.

In 1928 Niedenzu recognized as *Tetrapterys* sect. *Microphyllaris* a group of 20 species, 18 of which share a suite of characters that distinguish them from other sections of *Tetrapterys*: tiny epipetiolar stipules, marginal leaf glands, elongated, very thin, imbricated sepals that more or less conceal the petals in bud and are revolute in anthesis, and carpels that are distinct distally in the ovary. (Two of the species Niedenzu included in that section, *T. heteropetala* and *T. renidens*, are treated above as *Carolus renidens* and will not be discussed further here.) Most of those 18 species have samaras with four lateral wings, quite like those in other sections of *Tetrapterys*, so workers from Cavanilles to Cuatrecasas have been content to leave them in that genus, which has traditionally been defined by that X-shaped samara. Also in the 1928 work Niedenzu recognized in *Mascagnia* the species *M. sericans* Niedenzu and *M. stannea* (Grisebach) Niedenzu, which have the same characters given above for *Tetrapterys* sect. *Microphyllaris* but butterfly-shaped samaras, with the lateral wings dentate but not divided to the nut; in doing this Niedenzu followed his common practice of assigning species to genera on the basis of their fruits, regardless of what the other characters might say about probable relationships. In 1981 I treated in *Mascagnia* three species of this group (*M. benthamiana* (Grisebach in Martius) W. R. Anderson, *M. castanea* (Cuatrecasas) W. R. Anderson, and *M. poeppigiana* (A. Jusssieu) W. R. Anderson) that have butterfly-shaped samaras or mericarps derived from such samaras by reduction of the wings, but I have since concluded that it was a mistake to separate those species from the others in Niedenzu's *Tetrapterys* sect. *Microphyllaris*; the unifying characters listed above are more significant than the lobing or lack of lobing in the lateral wings of the samara. Wherever one puts one of those species, the others will have to follow. Davis et al. (2002), placed *Tetrapterys* sect. *Microphyllaris* (as represented by *Mascagnia stannea*) in an unsupported clade with *Dicella*, *Tricomaria*, *Heteropterys*, *Mascagnia chasei* [*Carolus chasei*], and *Hiptage*. That tree gives us little help in understanding the relationships of *Tetrapterys* sect. *Microphyllaris*, but it does remove the group effectively from *Mascagnia* s. str. and also from *Tetrapterys* s. str., represented by *T. discolor* (G. Meyer) DC., which came out quite separately in the 2002 tree. There is no support in morphology for placing this group of species in *Dicella*, *Tricomaria*, *Heteropterys*, *Carolus*, or *Hiptage* (see discussion under *Carolus*), so I see no alternative to recognizing them as a genus. It remains to be seen which type of samara, butterfly-shaped or X-shaped, was ancestral in this group.

Niedenzuella comprises 16 species of Central and South America.

KEY TO THE SPECIES OF *NIEDENZUELLA*

1a. Lamina at maturity tomentose, thinly sericeous, or glabrous below, the hairs never dense enough to completely hide the epidermis.
  2a. Abaxial hairs on young leaves loose and serpentine to strongly twisted, the lamina persistently tomentose or glabrescent in age.
    3a. Samara with the nut mostly smooth between lateral and dorsal wings, occasionally bearing 1 or 2 elongated outgrowths; inflorescence composed of umbels or dense corymbs with the internodes between pairs of flowers, if developed, mostly shorter than peduncles except occasionally the most proximal pair more distant from the others; eastern Ecuador, Amazonian Peru, and western Bolivia . . . . . 11. *N. peruviana*
    3b. Samara with several well-developed and obvious (although often low and rounded) outgrowths between lateral and dorsal wings; inflorescence composed of pseudoracemes with at least the more proximal pair ± well separated from the distal pairs; southeastern Bolivia, Paraguay, and southern and eastern Brazil.
      4a. Lamina narrowly to broadly elliptical and rounded or obtuse to acute at apex; eastern Brazil, found in the Planalto as far west as the Distrito Federal.
        5a. Petals abaxially sparsely to densely hairy; marginal leaf glands, if present, protuberant, often cylindrical; calyx glands, if present, 1.5–2.5 mm long, narrowly elliptical . . . . . 10. *N. multiglandulosa*
        5b. Petals glabrous; marginal leaf glands discoid, not or hardly protuberant; calyx glands, if

present, 1–1.3 mm long, broadly ovate or obovate . . . . . 16. *N. warmingiana*

4b. Lamina ± narrowly lanceolate, tapered distally to a narrowly acute or acuminate apex; southeastern Bolivia, southwestern Brazil (Mato Grosso and Rondônia), and southern Paraguay . . . . . 15. *N. suaveolens*

2b. Abaxial hairs on young leaves straight and ± strongly appressed, the lamina initially densely to sparsely sericeous below, at maturity thinly sericeous to glabrate.

6a. Samara with the nut mostly smooth between lateral and dorsal wings, rarely bearing 1 or 2 outgrowths.

7a. Petiole mostly bearing 2(–4) large discoid glands 0.7–1.5 mm diam.; northern Venezuela . . 2. *N. caracasana*

7b. Petiole mostly eglandular, occasionally bearing 2 small glands up to 0.5 mm diam.; southeastern Brazil.

8a. Petals abaxially sericeous; lamina soon quite glabrous on both sides, usually eglandular but rarely with impressed marginal glands; coastal Bahia to Rio de Janeiro . . . . . 4. *N. glabra*

8b. Petals glabrous or nearly so, occasionally with a few hairs; lamina abaxially ± evenly and persistently sericeous or eventually glabrescent, the hairs often very small and difficult to see; lamina eglandular or with 1–several prominent marginal glands; Minas Gerais and Espírito Santo to Santa Catarina . . . . . 6. *N. lucida*

6b. Samara with several well-developed and obvious (although often low and rounded) outgrowths between lateral and dorsal wings, or with several prominent ribs at right angles to dorsal wing.

9a. Lamina thinly but evenly and persistently sericeous below at maturity (hairs sometimes difficult to see, especially on older leaves, where they may be flattened and scale-like); petals glabrous or bearing a few hairs abaxially at base of limb; southeastern Brazil from Bahia to Rio de Janeiro . . . 5. *N. leucosepala*

9b. Lamina soon glabrate below or with some hairs persistent on base of midrib and nearby; petals mostly thinly but obviously sericeous abaxially on limb; South America.

10a. Lamina mostly acute or acuminate at apex but sometimes obtuse, usually bearing long hairs persistent on abaxial base of midrib, even in age; petiole bearing (1)2–4 glands or eglandular, ± persistently sericeous; anthers glabrous or sericeous; Atlantic South America from Guyana to southeastern Brazil, and with populations in Mato Grosso and Acre, as well as Bolivia, Peru, and Ecuador . . . . . 1. *N. acutifolia*

10b. Lamina mostly obtuse (to rounded) at apex, sometimes acute, soon quite glabrate, even on abaxial midrib; petiole mostly eglandular (rarely biglandular), mostly soon glabrate; anthers sparsely to densely pilose; coastal southeastern Brazil (Rio de Janeiro and São Paulo) . . . . . 9. *N. mogoriifolia*

1b. Lamina, even at maturity, persistently metallic-sericeous below (rarely patchily glabrescent in age), the vesture so dense as to completely hide the epidermis.

11a. Samara tetrapteroid, i.e., bearing 4 ± equal well-developed lateral wings.

12a. Samara nut smooth between dorsal and lateral wings; Meta, Colombia . . . . . 8. *N. metensis*

12b. Samara nut bearing outgrowths between dorsal and lateral wings; southeastern Brazil, Paraguay, and northeastern Argentina . . . . . 13. *N. sericea*

11b. Samara mascagnioid, i.e., bearing 2 ± equal well-developed lateral wings, or with the lateral wings variously and irregularly dissected and reduced.

13a. Petals abaxially sericeous with many hairs thinly scattered over much of the limb; samara nut bearing outgrowths between dorsal and lateral wings; southeastern Brazil, Paraguay, and northeastern Argentina . . . . . 13. *N. sericea*

13b. Petals glabrous; samara nut mostly smooth (or at most rugose) between dorsal and lateral wings, but some populations in Pará, Brazil, with several elongated intermediate outgrowths; Central and South America.

14a. Sepals separating to expose petals during enlargement of flower bud; anthers 0.5–1 mm long; lateral petals with limb 1.5–3.5 mm long; floriferous bracts up to 1 mm long, eglandular; pedicels up to 0.5 mm diam., sessile or raised on peduncles up to 0.5(–1) mm long.

15a. Lamina abaxially very tightly metallic-sericeous, with most hairs very short, 0.2–0.4 mm long; wings of samara with short tight hairs like those of lamina, to glabrate; marginal leaf glands, if present, 0.4–0.8 mm diam.; limb of

lateral petals 2.5–3.5 mm long; widespread in South America . . . . 12. *N. poeppigiana*

15b. Lamina abaxially relatively loosely sericeous with the outer, longer hairs 0.8–1.2 mm long; wings of samara with long, relatively loose hairs like those of lamina, to glabrate; marginal leaf glands 0.2–0.3 mm diam.; limb of lateral petals 1.5–2.2 mm long; southeastern Peru and adjacent Brazil and Bolivia . . . . . 7. *N. mater-dei*

14b. Sepals concealing petals almost throughout enlargement of flower bud; anthers (0.8–)1–1.5 mm long; lateral petals with limb 3–5 mm long; floriferous bracts at least 1 mm long, often longer, bearing 2 large abaxial glands or eglandular; pedicels 0.5–1 mm diam., subsessile or raised on peduncles up to 1 mm long.

16a. Lamina abaxially dark brown-sericeous; peduncles 0.5–1.5 mm long; Amazonas, Venezuela, and upper Rio Negro, Brazil . . . . . 3. *N. castanea*

16b. Lamina abaxially golden- or silvery-sericeous; peduncles mostly 1–4 mm long; Costa Rica, Panama, and Amazonian South America south to Bolivia and Paraguay . . . . . 11. *N. stannea*

1. Niedenzuella acutifolia (Cavanilles) W. R. Anderson, comb. nov. Basionym: *Tetrapterys acutifolia* Cavanilles, Diss. 9: 433, pl. 261. 1790. TYPE: French Guiana, *Stoupy s.n.* (holotype, P-JU 11707+A [F neg. 37465]).

Tetrapterys punctulata A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 10. 1832 [1833]. TYPE: Brazil. Minas Gerais: Sumidor, *A. Saint-Hilaire s.n.* (lectotype, designated here, P [MICH, WRA negs. 81-23-13 & 14]; duplicate, P).

There are four potential lectotypes in P, representing two or three collections from Minas Gerais. I am designating as lectotype a specimen annotated by Jussieu; it is a good representative of the species.

Tetrapterys fraxinifolia A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro]: *Vauthier 460* (lectotype, designated here, P [F neg. 35599]; isotypes, P, P-JU 11709).

Vauthier 460 was the sole type collection. It is represented in P by four sheets; as lectotype I am selecting the one in the general herbarium that was annotated by Jussieu.

Tetrapterys guilleminiana A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro]: *C. Gaudichaud 959* (lectotype, designated here, P-JU 11706+B [MICH, WRA neg. 81-17-17]; duplicate, P).

As syntypes Jussieu cited collections by Gaudichaud and Guillemin, both represented in P by several sheets. As lectotype I have selected a specimen in the Jussieu Herbarium that was annotated by Jussieu and has both flowers and fruits.

Tetrapterys lancifolia A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. *Tetrapterys acutifolia* var. *lancifolia* (A. Jussieu) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 27. 1909. TYPE: Brazil. Minas Gerais: "Ilhas de Aboithé," *P. Claussen s.n.* (lectotype, designated here, P [F neg. 35605]; isotypes, G, K, NY, P, P-JU).

The Claussen collection cited above is the sole type. It is represented in P by several sheets, of which I have selected as lectotype one that was annotated by Jussieu.

Bunchosia laxiflora Gardner, London J. Bot. 1: 168. 1842. TYPE: Brazil. Rio de Janeiro: 1837, *G. Gardner 17* (holotype, K).

Tetrapterys heteroalata Kralik, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 79: 277. 1908. TYPE: Brazil. São Paulo: near the city of São Paulo, Aug. 1901, *R. Wettstein & V. Schiffner* (holotype, WU not seen).

This species is widely distributed, being known from Atlantic South America from Guyana (*Jansen-Jacobs 3192*, MICH) to southeastern Brazil, with populations also in Mato Grosso (*Thomas et al. 4100*, MICH) and Acre (*Lowrie et al. 701*, MICH), as well as Bolivia (*Solomon 17711*, MO), Peru (*Gentry et al. 18588*, MICH), and Ecuador (*Gudiño 1343*, MICH).

2. Niedenzuella caracasana W. R. Anderson, sp. nov. TYPE: Venezuela. Distrito Federal: Cerro Naiguatá, Fila de las Delicias, north side, 1500 m, 10 Apr. 1976 (fr), *B. J. Manara s.n.* (holotype, MICH).

Niedenzuellae acutifoliae similis, sed samara sine alulis inter alas laterales et cristam dorsalem differt.

Woody vine, the stem initially sericeous with straight, tightly appressed hairs, soon glabrate. Petiole 4–6 mm long, sericeous to glabrate, bearing between middle and apex 2(–4) raised, discoid glands 0.7–1.5 mm diam.; lamina of larger leaves 7–8.5 × 2.5–4 cm, elliptical or narrowly ovate, cuneate at base, acute to obtuse at apex, coriaceous with the reticulum of veinlets visible to obscure in dried leaves, bearing 2–4 discoid marginal glands 0.7–1.3 mm diam. on

each side in proximal half, initially sericeous on both sides with straight, tightly appressed hairs but glabrate at maturity or thinly sericeous below, especially on midrib, the principal lateral veins 4–6 on each side; stipules 0.2–0.5 mm long, borne on petiole between base and middle. Inflorescence a short axillary panicle, sericeous to glabrate, comprising several short-stalked umbels or pseudoracemes of 2 or 4 flowers; bracts 0.8–1.5 mm long; peduncles 2–5 mm long; bracteoles 1–1.5 mm long, borne between middle and apex of peduncle; pedicels 7–9 mm long. Sepals (in fruit) revolute at apex, abaxially sericeous, adaxially glabrous, the anterior eglandular, the lateral 4 biglandular with the glands 2–2.5 mm long, narrowly elliptical; petals not seen, presumably yellow; anthers (seen only as remnants in fruit) apparently glabrous; styles dorsally rounded or truncate at apex. Samara consistently bearing 4 lateral wings and a dorsal crest, loosely sericeous on nut, sericeous to glabrescent on wings; lateral wings 10–17 × 7–10 mm, the upper and lower pairs subequal; dorsal crest 2–2.5 mm wide; nut smooth or rugose but completely lacking outgrowths between lateral and dorsal wings; torus 1.8 mm high.

Phenology. Collected with flower buds in May, and with fruits in February, April, and November.

Ecology and distribution. Wet, evergreen forests at 900–1500 m in the mountains above Caracas, on the north coast of Venezuela.

Etymology. The epithet *caracasana* refers to the source of all the known collections. In most of the characters that I can observe in this material it resembles *Niedenzuella acutifolia*, which I have not seen from Venezuela. *Niedenzuella caracasana* is distinguished by its samara, which lacks the outgrowths between dorsal and lateral wings that are always present in *N. acutifolia*. In addition, *N. caracasana* has thick, often obtuse laminas bearing very large discoid marginal glands and similar glands on the petioles. When flowers of *N. caracasana* become available for study they may furnish additional distinguishing characters.

Paratypes. VENEZUELA. **Aragua**: Cordillera Interior, entre El Paují y El Socorro, hacia Cerro La Ojedeña, al sur de El Consejo, *Steyermark & Perkins 122040* (MICH). **Distrito Federal**: Cerro Naiguatá, Lomas de Las Delicias, entre Quebrada de Basenilla y Quebrada Guayoyo, *Steyermark 92097* (NY); north-facing slopes, 7 km W of Hacienda Cocuizal, Quebrada Frontina, 7 Feb. 1967, *Manara s.n.* (NY).

3. Niedenzuella castanea (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Heteropterys castanea* Cuatrecasas, Webbia 13: 475. 1958. *Mascagnia castanea* (Cuatrecasas) W. R. Anderson, Mem. New York Bot. Gard. 32: 218. 1981. TYPE: Brazil. Amazonas: upper Rio Negro, *R. E. Schultes & F. López 10014* (holotype, US; isotypes, IAN, MICH, US).

This species is known from Amazonas, Venezuela (*Davidse et al. 17463*, MICH), and upper Rio Negro, Brazil.

4. Niedenzuella glabra (Sprengel) W. R. Anderson, comb. nov. Basionym: *Hiraea glabra* Sprengel, Neue Entdeck. 2: 154. 1821. *Tetrapterys glabra* (Sprengel) Grisebach in Martius, Fl. Bras. 12(1): 82. 1858. TYPE: Brazil. Espírito Santo: Between Vitoria and Bahia, *F. Sellow II it. 107* (lectotype, designated here, NY).

The specimen in NY that I am designating lectotype came from Niedenzu's herbarium and originated in B, so it is the logical replacement for the B holotype that was destroyed. The type was cited in the protologue as "Otto," certainly a slip for Sellow.

This species is known from the Brazilian states of Bahia (*Mori et al. 9642*, MICH), Espírito Santo, and Rio de Janeiro (*Gentry et al. 49471*, MICH).

5. Niedenzuella leucosepala (Grisebach) W. R. Anderson, comb. nov. Basionym: *Hiraea leucosepala* Grisebach, Linnaea 13: 240. 1839. *Tetrapterys leucosepala* (Grisebach) A. Jussieu, Arch. Mus. Hist. Nat. 3: 531. 1843. TYPE: Southern Brazil: *F. Sellow* (holotype, B† [F neg. 12734]; isotype, M not seen].

Grisebach cited as type a Sellow collection from southern Brazil, without number or precise locality. Niedenzu (1928: 194) said the collection was *Sellow II it. 88* from between Rio de Janeiro and Campos, São Paulo. He also cited what he considered an isotype at M. The latter specimen might be a candidate for lectotype of this name, but I do not want to make that designation until I have verified its identity.

Tetrapterys martiana Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 29. 1909. TYPE: Brazil. Rio de Janeiro: Fl. Itahipe, Mar.–Apr. 1822, *L. Riedel* (lectotype, designated here, K [MICH, WRA neg. 91-2-4]; duplicate, K).

Niedenzu cited syntypes collected by Luschnath, Martius, and Riedel (under Langsdorff). The Riedel collection of Mar.–Apr. 1822, is excellent and representative material, and I have selected the better of the two sheets at K to serve as lectotype.

This species occurs in southeastern Brazil from Bahia (*Amorim 3616*, MICH) to Rio de Janeiro.

6. Niedenzuella lucida (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Tetrapterys lucida* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 11. 1832 [1833]. TYPE: Brazil. Minas Gerais: Serra da Caraça, *A. Saint-Hilaire s.n.* (lectotype, designated here, P [F neg. 35608]; isotypes, P).

There was a single type collection, represented in P by three specimens, all annotated by Jussieu. I have selected the best of the three to serve as lectotype.

Hiraea multiflora Grisebach, Linnaea 13: 239. 1839. *Tetrapterys multiflora* (Grisebach) A. Jussieu, Arch. Mus. Hist. Nat. 3: 533. 1843. TYPE: Southern Brazil. [Rio de Janeiro]: *F. Sellow* [Ill it. B2249 e2287, fide Niedenzu, 1928] (lectotype, designated here, NY).

The NY sheet designated as lectotype to replace the lost holotype is from the Niedenzu herbarium, and is marked as coming from B. It may well be from the holotype; in any event, it is surely the best candidate for lectotype.

Tetrapterys cuneifolia Kralik, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 79: 278. 1908. TYPE: Brazil. São Paulo: near Rio Grande between Santos and the city of São Paulo, 1902, *M. Wacket* (holotype, WU not seen).

Tetrapterys cuneifolia f. *eglandulosa* Kralik, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 79: 278. 1908. TYPE: Brazil. São Paulo: near Campo Grande between Santos and the city of São Paulo, 1902, *M. Wacket* (holotype, WU not seen).

This Brazilian species is known from Minas Gerais and Espírito Santo (*Hatschbach 59748*, MICH) to Santa Catarina (*Occhioni 3749*, MICH).

7. Niedenzuella mater-dei (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Mascagnia mater-dei* Cuatrecasas, Brittonia 11: 167. 1959. TYPE: Peru. Madre de Dios: Iberia, *R. E. Schultes 6228* (holotype, US; isotypes, COL, GH, K, NY).

This species is known from southeastern Peru and adjacent Brazil (*Pardo et al. 120*, MICH) and Bolivia (*Rueda 947*, MICH).

8. Niedenzuella metensis (Cuatrecasas) W. R. Anderson, comb. nov. Basionym: *Tetrapterys metensis* Cuatrecasas, Webbia 13: 419. 1958. TYPE: Colombia. Meta: Villavicencio, *Bro. Apollinaire s.n.* (holotype, US).

9. Niedenzuella mogoriifolia (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Tetrapterys mogoriifolia* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 11. 1832 [1833]. TYPE: Brazil. Near Sebastianópolis [Rio de Janeiro], *A. Saint-Hilaire s.n.* (lectotype, designated here, P [F neg. 35609]).

There are two sheets in P that were collected by St.-Hilaire from near Rio, both annotated with the basionym by Jussieu. They appear to represent different gatherings, because one is in flower and immature fruit and the other is in old fruit. I believe they should be regarded as syntypes, and have designated the better of them as lectotype.

This species is known from coastal southeastern Brazil, in Rio de Janeiro and São Paulo (*Gentry & Zardini 49400*, MICH).

10. Niedenzuella multiglandulosa (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Tetrapterys multiglandulosa* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Minas Gerais: Curvelo, *Claussen s.n.* (lectotype, designated here, P [MICH, WRA negs. 81-24-1 & 2]; isotypes, G, P, P-JU). Figure 10.

There are several Claussen sheets in P, all from Minas Gerais, which is the locality Jussieu gave; they may represent more than one collection. The two sheets from Curvelo represent the best candidates for lectotype, because they were both annotated by Jussieu. I have selected the better of them as lectotype.

Tetrapterys adenodon Miquel, Linnaea 22: 518. 1849. TYPE: Brazil. Minas Gerais: near Caldas, *A. Regnell I 28* (holotype, U; isotypes, GH, K, MEL, NY).

11. Niedenzuella peruviana (Niedenzu) W. R. Anderson, comb. nov. Basionym: *Tetrapterys multiglandulosa* var. *peruviana* Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 29. 1909. TYPE: Peru. "Tambo Azalaya," *A. Weberbauer 1125* (holotype, B† [F neg. 12739]).

This species is known from eastern Ecuador (*Veill 5976*, MICH), Amazonian Peru, and western Bolivia (*Brummitt et al. 19359*, MICH).

12. Niedenzuella poeppigiana (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Hiraea poeppigiana* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 260. 1840. *Tetrapterys poeppigiana* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 87. 1858. *Mascagnia poeppigiana* (A. Jussieu) W. R. Anderson, Mem. New York Bot. Gard. 32: 219. 1981. Lectotype collection, designated by Anderson (1981: 219): Brazil. Amazonas: "Prov. Rio Negro," *E. Poeppig 2799* (lectotype, designated here, G; duplicates, MICH, NY, P, US, W).

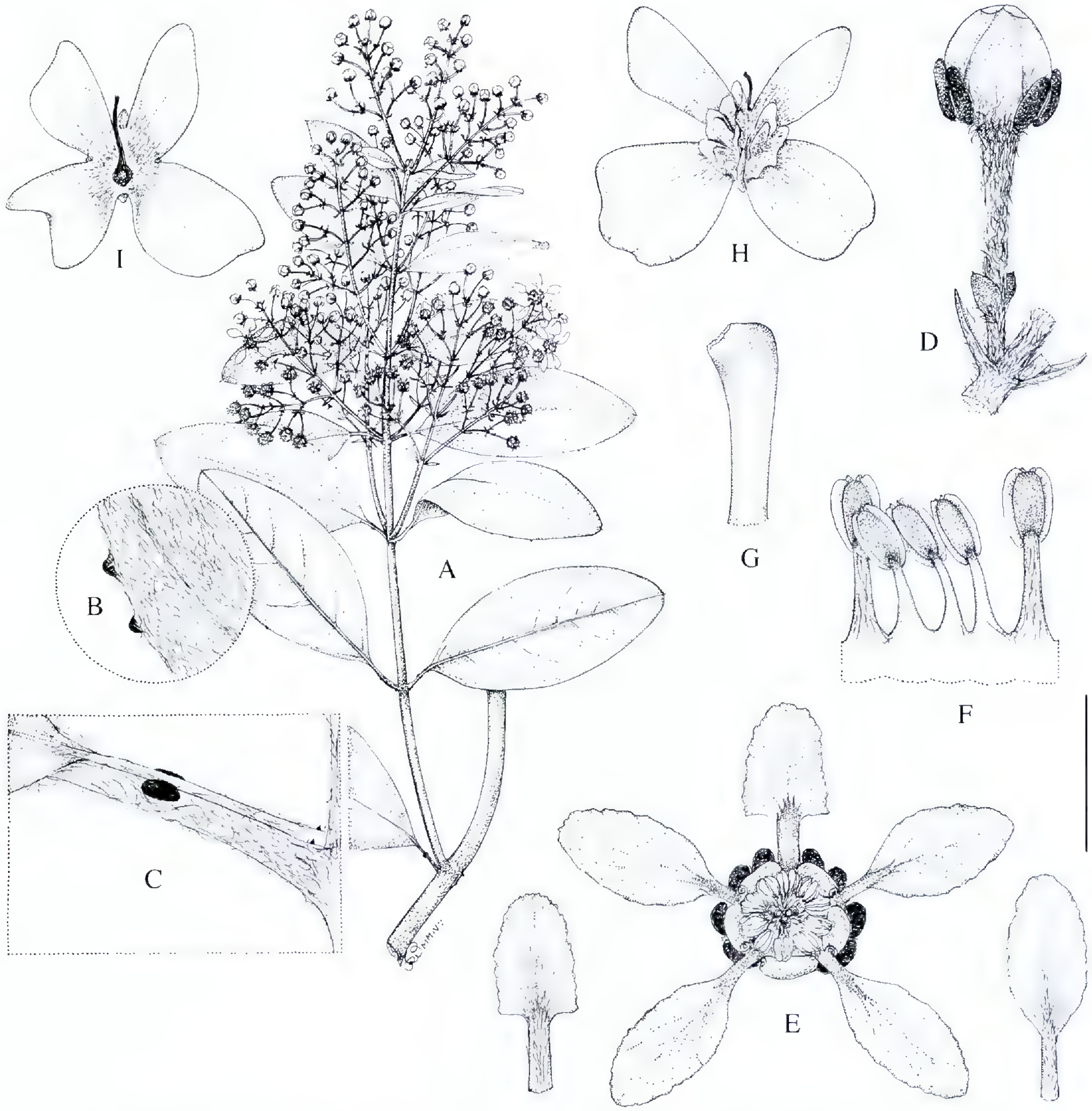

Figure 10. *Niedenzuella multiglandulosa* (A. Jussieu) W. R. Anderson. —A. Flowering branch. —B. Margin of lamina, abaxial side, to show glands and tomentum. —C. Petiole to show glands and stipules at base. —D. Flower bud. —E. Flower, posterior petal uppermost, and abaxial views of posterior petal (left) and lateral petal (right). —F. Abaxial view of five stamens, the two large filaments opposite posterior-lateral petals. —G. Apex of style. —H. Samara, abaxial view. —I. Samara, adaxial view. Scale bar equivalents: A, 4 cm; B–E, 4 mm; F, 2 mm; G, 0.8 mm; H & I, 1 cm. A–D, *Anderson 13628* (MICH); E–I, *Anderson 11608* (MICH).

There were two syntype collections, by Martius and Poeppig. In 1981 I designated *Poeppig 2799* the lectotype collection, but did not specify a sheet or institution. The G specimen is an excellent representative and was annotated by Jussieu, so I am designating that the lectotype specimen.

Tetrapterys lalandiana A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Rio de Janeiro: *Lalande s.n.* (holotype, P [F neg. 35607]).

Tetrapterys adenoloma Skottsberg, Kongl. Svenska Vetenskapsakad. Handl. 35(6): 10, pl. 2 fig. 6. 1901. TYPE: Brazil. São Paulo: Santos, *C. Mosén 3353* (holotype, S not seen).

Mascagnia subsericea Cuatrecasas, Webbia 13: 370. 1958. TYPE: Colombia. Amazonas: Soratama, *H. García-Barriga 14089* (holotype, US; isotype, NY).

13. Niedenzuella sericea (A. Jussieu in A. St.-Hilaire) W. R. Anderson, comb. nov. Basionym: *Hiraea sericea* A. Jussieu in A. St.-Hilaire, Fl. Bras. Merid. 3: 16. 1832 [1833]. *Tetrapterys sericea* (A. Jussieu in A. St.-Hilaire) A. Jussieu,

Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Near Rio de Janeiro, *A. St.-Hilaire catal. A[1] no. 380* (lectotype, designated here, P [F neg. 35612]; isotypes, P).

The St.-Hilaire collection cited above was the sole type. It is represented in P by three sheets; I have selected the best of those, annotated by Jussieu, to serve as lectotype.

Hiraea laurifolia A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 260. 1840. *Tetrapterys laurifolia* (A. Jussieu) Grisebach in Martius, Fl. Bras. 12(1): 88. 1858. TYPE: Brazil. Minas Gerais: Tejuco [Diamantina], *C. F. P. Martius s.n.* (holotype, M; isotype, P-JU).

Tetrapterys chalcophylla A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 264. 1840. TYPE: Brazil. Bahia: *J. Blanchet 1062* (holotype, G).

Tetrapterys glandulosa Grisebach in Martius, Fl. Bras. 12(1): 83. 1858. TYPE: Brazil. Minas Gerais: near São Caetano, *G. Gardner 4477* (holotype, K [MICH, WRA neg. 81-9-13]; isotypes, BM, K).

Tetrapterys ligustrifolia Niedenzu, Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 4: 14. 1912, non *T. ligustrifolia* A. Jussieu in A. St.-Hilaire, 1833. TYPE: Brazil. Minas Gerais: 1845, *J. F. Widgren* (lectotype, designated here, NY; duplicates, LE, MICH, U).

Niedenzu had three syntypes, collected by Widgren, Lindberg, and Mosén, all in Minas Gerais. I have seen only the Widgren collection, and am designating as lectotype the NY sheet that came from Niedenzu's herbarium.

This species is known from southeastern Brazil, Paraguay (*Zardini & Gamarra 55629*, MICH), and northeastern Argentina (*Anderson 13612*, MICH).

14. Niedenzuella stannea (Grisebach) W. R. Anderson, comb. nov. Basionym: *Heteropterys stannea* Grisebach, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 46. 1854. *Mascagnia stannea* (Grisebach) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1912/13: 12. 1912. TYPE: Costa Rica, Monte Aguacate, Nov. 1846, *A. Ørsted* (holotype, GOET not seen; isotype, C). Figure 11.

Tetrapterys benthamiana Grisebach in Martius, Fl. Bras. 12(1): 88. 1858. *Malpighiodes benthamiana* (Grisebach in Martius) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 31. 1909. *Mascagnia benthamiana* (Grisebach in Martius) W. R. Anderson, Mem. New York Bot. Gard. 32: 217. 1981. TYPE: Brazil. Pará: near Santarém, Nov.–Mar. 1849–50, *R. Spruce s.n.* (holotype, GOET not seen; isotypes, BM, CGE, E, G, GH, K, M [F neg. 19338], NY).

Banisteria cornifolia var. *discolor* Donnell Smith, Bot. Gaz. (Crawfordsville) 24: 391. 1897. *Banisteriopsis discolor* (Donnell Smith) Small, N. Amer. Fl. 25: 132. 1910. *Banisteria discolor* (Donnell Smith) Niedenzu in Engler, Pflanzenr. IV, 141: 451. 1928. TYPE: Costa Rica: San Pedro de la Calabaza, *A. Tonduz s.n.* [CR 10924] (holotype, CR; isotype, US).

Mascagnia sericans Niedenzu in Chodat & Hassler, Bull. Herb. Boissier, Sér. 2, 7: 284. 1907. TYPE: Paraguay. Bellavista, *E. Hassler 7825* (lectotype, designated here, G; isotypes, G, K, MICH, NY).

The holotype sheet of Hassler 7825 was destroyed at B. There are four isotypes at G; the lectotype is the isotype that was annotated lectotype by W. R. Anderson.

Mascagnia sericans subsp. *buricana* Cuatrecasas & Croat, Ann. Missouri Bot. Gard. 67: 912. 1980 [1981]. TYPE: Panama, Burica Peninsula, W of Puerto Armuelles, *T. Croat 22495* (holotype, MO; isotype, NY).

This species is defined broadly here, and with that circumscription it is known from Costa Rica, Panama, and Amazonian South America south to Bolivia (*Solomon & Ureullo 14137*, MICH) and Paraguay.

15. Niedenzuella suaveolens (A. Jussieu) W. R. Anderson, comb. nov. Basionym: *Tetrapterys suaveolens* A. Jussieu, Ann. Sci. Nat. Bot., Sér. 2, 13: 263. 1840. TYPE: Bolivia, Santa Cruz: Santiago de Chiquitos, *A. d'Orbigny 910* (holotype, P; isotype, G).

This species is known from southeastern Bolivia, southwestern Brazil (Mato Grosso [*Hatschbach 63892*, MICH] and Rondônia [*Anderson 12156*, MICH]), and southern Paraguay (*Tressens et al. 4770*, MICH).

16. Niedenzuella warmingiana (Grisebach) W. R. Anderson, comb. nov. Basionym: *Heteropterys warmingiana* Grisebach, Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn 1875: 135. 1875. *Tetrapterys warmingiana* (Grisebach) Niedenzu, Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 20. 1909. TYPE: Brazil. Minas Gerais: Lagoa Santa, *J. Warming s.n.* (holotype, C not seen [F neg. 21354]).

Niedenzu (1928: 183) implied that Grisebach had two syntypes, both collected by Warming in 1863, on 14 Sep. and 5 Nov. If that is true, one should be selected as lectotype.

Acknowledgments. Karin Douthit drew the illustrations with her usual skill and attention to detail. My collaborators, Christiane Anderson and Charles Davis, have given unfailing assistance and advice. Roy Vickery and Vicki Noble at BM sent me notes on and a scan of the type of *Triopterys hiraea*. Piet

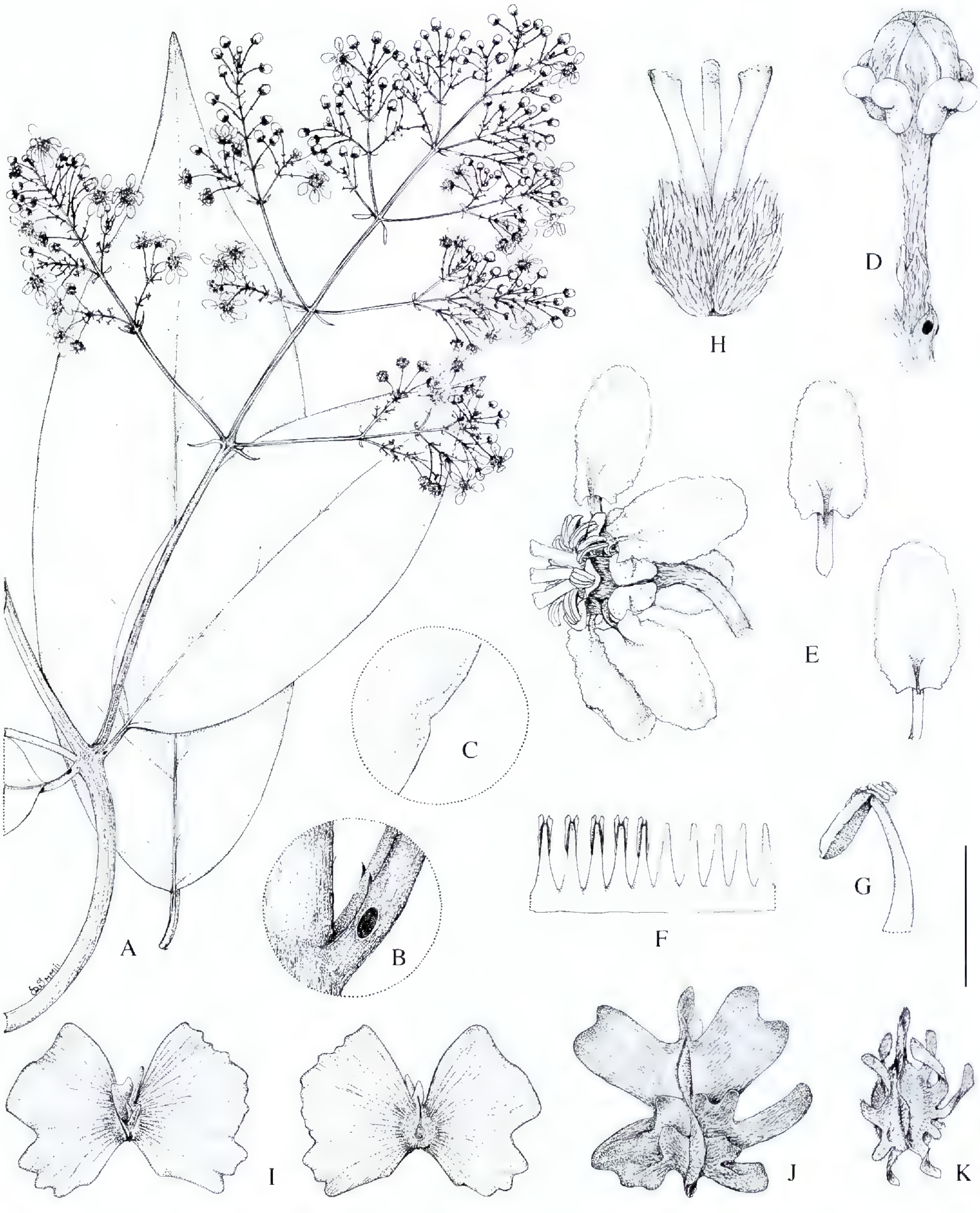

Figure 11. *Niedenzuella stannea* (Grisebach) W. R. Anderson. —A. Flowering branch and detached large leaf. —B. Base of petiole showing large gland and tiny epipetiolar stipules. —C. Margin of lamina to show embedded gland. —D. Flower bud. —E. Flower, lateral view, posterior petal uppermost, and adaxial views of lateral petal (right) and posterior petal (above). —F. Androecium laid out, adaxial view, with five anthers removed. —G. Lateral view of stamen. —H. Gynoecium, anterior style in center. —I. Normal samara, abaxial view (left) and adaxial view (right). —J & K. Reduced malformed samaras, abaxial views. Scale bar equivalents: A, 4 cm; B, 8 mm; C, 2 mm; D–F, 4 mm; G & H, 2 mm; I, 2 cm; J & K, 1 cm. A–H, *Schunke V. 10947* (San Martín, Peru; MO); I, *Belshaw 3265* (San Martín, Peru; MICH); J, *Oliveira 4195* (Pará, Brazil; MICH); K, *Martinelli 7278* (Pará, Brazil; MICH).

Stoffelen at BR sent me a scan of the holotype of *Mascagnia doniana* and helpful replies to my questions on morphological details. Fernand Jacquemoud at G arranged for me to receive scans of their isotypes of *Heladena hassleriana* and *Mascagnia multiglandulosa*. Jochen Heinrichs at GOET was most helpful with information about types in the Grisebach herbarium. At M, Günter Gerlach and Alison Davies arranged for me to receive scans of the type of *Hiraea laurifolia*, and Franz Schuhwerk directed me to BR when I was seeking the type of *Mascagnia doniana*. Jürgen Döbereiner and Carlos H. Tokarnia donated especially interesting specimens of plants belonging to this group of genera. I am grateful to the curators of the following herbaria for sending to MICH gifts and loans of Malpighiaceae, and for their hospitality and assistance when I visited their institutions: A, BM, C, CEPEC, CGE, COL, CR, E, F, G, GB, GH, IAN, INPA, K, L, LE, LIL, M, MEL, MO, NY, P, S, U, US, VEN, W.

Literature Cited

Anderson, W. R. 1980. Notes on *Mascagnia* in South America. Contr. Univ. Michigan Herb. 14: 17–23.

———. 1981. The botany of the Guayana Highland Part XI. Malpighiaceae. Mem. New York Bot. Gard. 32: 21–305.

———. 1987. Notes on Neotropical Malpighiaceae—II. Contr. Univ. Michigan Herb. 16: 55–108.

———. 1990a. The taxonomy of *Jubelina* (Malpighiaceae). Contr. Univ. Michigan Herb. 17: 21–37.

———. 1990b. Notes on Neotropical Malpighiaceae—III. Contr. Univ. Michigan Herb. 17: 39–54.

———. 1993. Notes on Neotropical Malpighiaceae—IV. Contr. Univ. Michigan Herb. 19: 355–392.

———. 1997. *Excentradenia*, a new genus of Malpighiaceae from South America. Contr. Univ. Michigan Herb. 21: 29–36.

———. 1999. Notes on Neotropical Malpighiaceae—VII. Contr. Univ. Michigan Herb. 22: 1–19.

Cameron, K. M., M. W. Chase, W. R. Anderson & H. G. Hills. 2001. Molecular systematics of Malpighiaceae: Evidence from plastid *rbc*L and *mat*K sequences. Amer. J. Bot. 88: 1847–1862.

Cavanilles, J. 1790. Nona Dissertatio Botanica. Madrid.

Colla, L. A. 1824. Hortus Ripulensis. Torino.

Davis, C. C., W. R. Anderson & M. J. Donoghue. 2001. Phylogeny of Malpighiaceae: Evidence from chloroplast *ndh*F and *trn*L-F nucleotide sequences. Amer. J. Bot. 88: 1830–1846.

———, C. D. Bell, S. Mathews & M. J. Donoghue. 2002. Laurasian migration explains Gondwanan disjunctions: Evidence from Malpighiaceae. Proc. Natl. Acad. U.S.A. 99: 6833–6837.

Grisebach, A. H. R. 1858. Malpighiaceae. Columns 1–124 *in* C. F. P. Martius (editor), Flora Brasiliensis, Vol. 12(1). Leipzig.

Jacquin, N. J. 1760. Enumeratio Systematica Plantarum. T. Haak, Leiden.

Johnson, D. M. 1986. Revision of the Neotropical genus *Callaeum* (Malpighiaceae). Syst. Bot. 11: 335–353.

Jussieu, Adrien de. 1843. Monographie de la famille des Malpighiacées. Arch. Mus. Hist. Nat. 3: 5–151, 255–616 pl. 1–23.

Linnaeus, C. 1753. Species Plantarum, Vol. 1. Stockholm.

Lombello, R. A. & E. R. Forni-Martins. 2002. Cytogenetics of twelve species of Malpighiaceae A. Jussieu from southeastern Brazil. Caryologia 55: 241–250.

Lowrie, S. R. 1982. The Palynology of the Malpighiaceae and Its Contribution to Family Systematics. Ph.D. Dissertation. University of Michigan, Ann Arbor. [University Microfilms #82-21999.]

Morton, C. V. 1968. A typification of some subfamily, sectional, and subsectional names in the family Malpighiaceae. Taxon 17: 314–324.

Niedenzu, F. 1908. De genere *Mascagnia*. Arbeiten Bot. Inst. Königl. Lyceum Hosianum Braunsberg 3: 3–29.

———. 1909. De genere *Tetrapteryge*. Verz. Vorles. Königl. Lyceum Hosianum Braunsberg 1909/10: 3–56.

———. 1928. Malpighiaceae. Pp. 1–870 *in* A. Engler (editor), Das Pflanzenreich, Vol. IV, 141. Wilhelm Engelmann, Leipzig.

O'Donell, C. A. & A. Lourteig. 1943. Malpighiaceae argentinae. Lilloa 9: 221–316 pl. 1–18.

New Combinations in *Manekia*, an Earlier Name for *Sarcorhachis* (Piperaceae)

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ABSTRACT. *Manekia* Trelease is recognized as an earlier name for *Sarcorhachis* Trelease (Piperaceae). After examination of available herbarium material, including appropriate type specimens, it is clear that *Manekia* and *Sarcorhachis* are taxonomic synonyms. New combinations are made for four species of *Manekia* originally described in the genus *Sarcorhachis*: *Manekia incurva* (Sieber ex Schultes) Arias, Callejas & Bornstein, *Manekia obtusa* (Miquel) Arias, Callejas & Bornstein, *Manekia sydowii* (Trelease) Arias, Callejas & Bornstein, and *Manekia venezuelana* (Steyermark) Arias, Callejas & Bornstein. The following names newly synonymize: *Sarcorhachis obtusa* (Miquel) Trelease var. *cordata* Yuncker and *Sarcorhachis sydowii* Trelease var. *hirsuta* Yuncker. Additionally, a lectotype is designated for *Manekia sydowii* (Trelease) Arias, Callejas & Bornstein.

RESUMEN. *Manekia* Trelease se reconoce como un nombre más antiguo para *Sarcorhachis* Trelease (Piperaceae). Después de examinar material de herbario, incluyendo especímenes tipo apropiados, es evidente que *Manekia* y *Sarcorhachis* son sinónimos taxonómicos. Se incluyen nuevas combinaciones para cuatro especies de *Manekia* originalmente descritas como *Sarcorhachis*: *Manekia incurva* (Sieber ex Schultes) Arias, *Manekia obtusa* (Miquel) Arias, Callejas & Bornstein, *Manekia sydowii* (Trelease) Arias, Callejas & Bornstein, *Manekia venezuelana* (Steyermark) Arias, Callejas & Bornstein. Los siguientes nombres se reconocen como sinónimos nuevos: *Sarcorhachis obtusa* (Miquel) Trelease var. *cordata* Yuncker, *Sarcorhachis sydowii* Trelease var. *Hirsuta* Yuncker. Adicionalmente, se designa un lectotipo para *Manekia sydowii* (Trelease) Arias, Callejas & Bornstein.

Key words: *Manekia*, Neotropics, Piperaceae, *Sarcorhachis*.

Sarcorhachis Trelease is a widely recognized genus of perhaps five species ranging from southern Nicaragua to northern Peru and Brazil, with one species described from the Lesser Antilles (Jaramillo & Manos, 2001; Jaramillo et al., 2004; Mabberley, 1997). The genus was segregated from *Piper* on the basis of axillary (vs. leaf-opposed) inflorescences (Trelease, 1927), and a recent phylogenetic analysis based on DNA sequence data from three genes (*rbc*L, *atp*B, and 18S) confirms that it is a distinct taxon worthy of generic status (Jaramillo et al., 2004).

Bornstein (1996) recognized that the single species of *Manekia*, *M. urbani* Trelease, shares several key features with *Sarcorhachis*, which collectively help to distinguish *Manekia* from the remaining taxa in Piperaceae. These features include a scandent habit; alternate, palmately veined leaves; petioles vaginate for their entire length, with adaxial, deciduous, marginal stipule scars that often project beyond the base of the blade; spikes usually axillary, occasionally terminal, either solitary or paired; and fruits laterally compressed and either immersed in or coalescent with the fleshy rachis.

According to the principle III of the *International Code of Botanical Nomenclature* (Greuter et al., 2000), *Manekia* has strict priority over *Sarcorhachis*, having been published two months earlier. However, Bornstein (1996) proposed that *Sarcorhachis* should be

conserved against *Manekia*, because it is the more established name in the botanical literature concerning the Piperaceae, and its conservation would minimize name changes resulting from the merger of two genera. The proposal was rejected, thereby maintaining priority for *Manekia* (Committee for Spermatophyta, 1998). As a result, any valid taxa within *Sarcorhachis* must be transferred to *Manekia* with new combinations provided, which we accomplish here prior to a formal revision of this genus. Complete synonymy and typification are given for all accepted taxa.

Manekia Trelease, Repert. Spec. Nov. Regni Veg. 23: 313. [20 March] 1927. TYPE: *Manekia urbani* Trelease, *E. L. Ekman 5242* (holotype, S not seen; isotype, ILL).

Sarcorhachis Trelease, Contr. U.S. Natl. Herb. 26: 17. [21 May] 1927. TYPE: *Sarcorhachis incurva* (Sieber ex Schultes) Trelease.

The genus name *Manekia* was originally described on the basis of a single species from Haiti. With the merger of *Sarcorhachis* and *Manekia*, the range for the genus now includes Haiti, the Lesser Antilles (Guadeloupe, Dominica, Martinique, and St. Vincent), southern Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Ecuador, northern Peru, and Brazil (Atlantic forest). The altitudinal distribution ranges from sea level to 2000 m, with species growing in different environments inside primary and secondary forest.

The original description of *Manekia* indicates that the flowers have two stamens and one carpel, an erroneous flower formula if compared with the flowers in *Sarcorhachis* (four carpels and four stamens). According to Bornstein (1996), differences in stamen and stigma numbers in the original description of *Manekia* are due to the analysis of immature inflorescences. The generitype *Manekia urbani* is easily recognized on the basis of its small leaves (4–12 cm long and 3–12 cm wide) and short inflorescences (4–12 cm long). It is known only from Haiti in the vicinity of the type locality, with the most recent collections in 1983. With the extensive loss of forested habitat in Haiti, it is possible that the species is now extinct. Attempts should be made to locate populations there and possibly in the Dominican Republic.

1. **Manekia incurva** (Sieber ex Schultes) Arias, Callejas & Bornstein, comb. nov. Basionym: *Piper incurvum* Sieber ex Schultes, Mant. 1 (Schultes): 238. 1822. *Sarcorhachis incurva* (Sieber ex Schultes) Trelease, Contr. U.S. Natl. Herb. 26: 17. 1927. TYPE: Martinique, *F. W. Sieber 254* (holotype, B destroyed; lectotype, designated by Jones (1985: 99), ILL; isotypes, GH, MO, US, photo ex US at A).

Piper guadeloupense C. DC. is possibly a heterotypic synonym for *Manekia incurva*, but type specimens were not directly examined. Two photos of one of the syntypes that is at GH were found at A and US. The name *Sarcorhachis incurva* (Sieber ex Schultes) Trelease var. *stehlei* Trelease ex Stehlé, Bull. Soc. Bot. France 83: 627. 1936 is found as nomen nudum for *Manekia incurva* after examination of the original reference. More research needs to be done for the names *Sarcorhachis incurva* (Sieber ex Schultes) Trelease var. *typica* Trelease ex Stehlé and *Sarcorhachis incurva* (Sieber ex Schultes) Trel. var. *treleasii* Stehlé. These two names are cited in several secondary references as varieties of *Manekia incurva*, but original descriptions were not consulted. As a consequence, it is not possible to prove if the names were valid or not.

N.B. The type collections by L. C. Richard, presumably from French Guiana, are more likely from the Lesser Antilles as part of his travels from 1785 to 1789, where he is known to have collected on Guadeloupe and Martinique (Bornstein, unpublished).

Manekia incurva is also quite similar to *Manekia naranjoana* (C. DC.) Callejas, including identical features of leaf morphology (shape, venation, texture, color, among others), and the number and shape of several floral parts. We are currently analyzing all available specimens to determine whether these two species should be merged, with *Manekia incurva* having priority.

Manekia sydowii and *Manekia venezuelana* (these new combinations presented herein), together with *Manekia incurva* and *Manekia naranjoana*, constitute a difficult species complex. These four taxa share floral similarities, which include the number of stamens and stigmatic lobes, as well as size and shape of flowers, fruits, bracts, anthers, and pistils. On the other hand, some vegetative characters such as leaf size, shape, texture, and indument are quite variable over the geographic and altitudinal range of these species. Until a more thorough study, including molecular analysis, is complete, we provide only new combinations for these taxa. It is quite possible that further analysis will result in the recognition of fewer species than indicated here.

2. **Manekia obtusa** (Miquel) Arias, Callejas & Bornstein, comb. nov. Basionym: *Artanthe obtusa* Miquel, Syst. Piperac. 416. 1844. *Sarcorhachis obtusa* (Miquel) Trelease, Contr. U.S. Natl. Herb. 26: 118. 1929. TYPE: Brazil, *F. Sellow s.n.* (holotype, B not seen).

Sarcorhachis obtusa (Miquel) Trelease var. *cordata* Yuncker, Bol. Inst. Bot. (São Paulo) 3: 134, fig. 117. 1966. Syn. nov. TYPE: Brazil, Paraná, Jacarei, 14 Aug. 1914, *I. G. Jönsson 862a* (holotype, S, fragments at ILL; isotypes, LE, US not seen).

Piper convallariodorum C. DC., Bull. Herb. Boissier, ser. 2, 1(4): 356. 1901. *Sarcorhachis convallariodorum* (C. DC.) Steyermark, Pittieria 3: 32. 1971. TYPE: Brazil. Serra Ouro Preto, "in locis umbrosis ad rivulos," 1050 m, *C. A. W. Schwacke 10227* (holotype, G-DEL; photo ex G-DEL at GH, US).

This species is clearly distinct from the other species of *Manekia* on the basis of the size of the anthers (0.5–1.5 mm wide) and leaf apex rounded or obtuse (vs. acute or acuminate in the rest of species). In addition, the lack of stipular scar that projects beyond the petiole onto the base of the blade is useful in recognizing this species. With rare exceptions, the other species of *Manekia* have a scar formed by the stipular sheath that occurs along the entire length of the petiole and extends onto the blade for a centimeter or more.

3. Manekia sydowii (Trelease) Arias, Callejas & Bornstein, comb. nov. Basionym: *Sarcorhachis sydowii* Trelease, Repert. Spec. Nov. Regni Veg. 48: 16. 1940. TYPE: Ecuador. Prov. Pichincha: prope Mindo, 1000–2000 m, *H. Sydow 317* (lectotype, designated here, US 1743685; isotype, US 1743684).

Sarcorhachis sydowii Trelease var. *hirsuta* Yuncker, Ann. Missouri Bot. Gard. 53: 380. 1966. Syn. nov. TYPE: Ecuador. Zamora: road from Loja to Zamora, km 45–51, 1400–1600 m, *C. H. Dodson & L. B. Thien 1423* (holotype, MO; isotype, NY).

The type specimen for *Manekia sydowii* was at US. Two separate sheets were found without a designation of holotype and/or isotype. Therefore, the most complete and well preserved herbarium specimen was selected as a lectotype for *Manekia sydowii*. This species has the greatest amount of morphological variation within the genus, especially in leaf shape (ovate to elliptic or rounded), pubescence of the leaves and stems (glabrous to highly pubescent), and leaf texture (membranous to coriaceous). This may be due to its wide range in habitats from low-elevational to montane humid forest. This species constitutes a difficult complex that requires a more thorough systematic evaluation.

4. Manekia venezuelana (Steyermark) Arias, Callejas & Bornstein, comb. nov. Basionym: *Sarcorhachis venezuelana* Steyermark, Pittiera 3: 33. 1971. TYPE: Venezuela. Carabobo: "selva siempre verde a lo largo del Río San Gían, al sur de Borburata, arriba de la Planta Eléctrica, entre Los Tanques y la Toma," 750 m, *J. A. Steyermark & C. S. Steyermark 95152* (holotype, VEN; isotypes, S, US).

This species is very similar to *Manekia sydowii* in several characters like leaf shape and size. Steyermark recognized this species on the basis of the number stigmatic lobes (five), the glabrate ridge of the rachis, and the occurrence of two spikes in the leaf axil. However, after review of types and other supplementary material, it is apparent that these features are the same for both species. Vegetative features are also similar between the two species, and therefore they may be combined in our revision, with *Manekia sydowii* having priority.

A sixth species of *Sarcorhachis*, *Sarcorhachis schwackei*, was described by Yuncker (1966) on the basis of a collection from Brazil (*Schwacke II, 18* at NY). It is not actually a species of *Sarcorhachis*, since it does not have axillary inflorescences and the leaf venation is clearly pinnate (vs. palmate). The flowers and fruits are also different from other species of *Sarcorhachis* (e.g., not immersed in the rachis).

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Literature Cited

Bornstein, A. 1996. Proposal to conserve the name *Sarcorhachis* against *Manekia* (Piperaceae). Taxon 45: 323–324.

Committee for Spermatophyta. 1998. (1223) Conserve *Sarcorhachis* Trel. against *Manekia* Trel. (Piperaceae). Taxon 47: 870.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Jaramillo, M. A. & P. S. Manos. 2001. Phylogeny and patterns of floral diversity in the genus *Piper* (Piperaceae). Amer. J. Bot. 88: 706–716.

———, P. S. Manos & E. A. Zimmer. 2004. Phylogenetic relationships of the perianthless Piperales: Reconstructing the evolution of floral development. Int. J. Pl. Sci. 165: 403–416.

Jones, A. G. 1985. An annotated catalogue of type specimens in the University of Illinois Herbarium (ILL)—1. Piperaceae, except *Peperomia*. Phytologia 58: 1–102.

Lee, D. W. & J. H. Richards. 1991. Heteroblastic development in vines. Pp. 197–285 *in* F. E. Putz & H. A. Mooney (editors), The Biology of Vines. Cambridge Univ. Press, Cambridge.

Mabberley, D. J. 1997. The Plant-Book, a Portable Dictionary of the Vascular Plants. 2nd ed. Cambridge Univ. Press, Cambridge.

Trelease, W. 1927. The Piperaceae of Panama. Contr. U.S. Natl. Herb. 26: 15–50.

Yuncker, T. G. 1966. New Species of Piperaceae from Brazil. Bol. Inst. Bot. (São Paulo) 3: 133–134.

Una Nueva Especie de *Schwenckia* (Solanaceae) del Caquetá, Colombia

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Resumen. Se describe e ilustra una nueva especie del género *Schwenckia* (Solanaceae) encontrada en el Departamento del Caquetá, Cordillera Oriental de Colombia, *Schwenckia alvaroana* Benítez. La misma se distingue del resto de las especies de la sección *Schwenckia* por su hábito trepador y sus corolas de menor tamaño. También se proporciona una clave para separar las especies hasta ahora reconocidas de la sección *Schwenckia*.

Abstract. A new species in Solanaceae from the Department of Caquetá, Cordillera Oriental of Colombia, *Schwenckia alvaroana* Benítez, is described and illustrated. It is distinct from other species within section *Schwenckia* by its climbing habit and smaller corolla. Also a key for the currently recognized species of the members of section *Schwenckia* is provided.

Key words: Colombia, *Schwenckia*, Solanaceae.

El género *Schwenckia* L. (Solanaceae) incluye ca. 25 especies americanas de regiones tropicales y subtropicales desde América Central, Las Antillas hasta el noreste de Argentina (Hunziker, 2001), de las cuales 17 están presentes en Brasil (Carvalho, 1978a, b). La clasificación infragenérica de *Schwenckia* fue hecha por Bentham en 1846, y desde entonces la misma se ha mantenido hasta hoy día. En ella fueron consideradas 5 secciones, diferenciadas principalmente sobre la base de sus caracteres florales. Representa un género morfológicamente distintivo de otros géneros de Solanaceae por su peculiar corola, "bizarra" (Hunziker, 2001: 94), en la que los lóbulos son modificados hacia formas angostas expandidas en su parte basal denominadas lóbulos medios, los que toman formas diferentes tales como dientes, acículas, setas, clavas; las expansiones son denominadas lóbulos laterales contiguos (Benítez de Rojas, 1993).

Durante los estudios en la familia Solanaceae, se encontró material de una especie distintiva y no descrita perteneciente al género *Schwenckia*, colectada en el Municipio San Vicente de Caguán, Departamento del Caquetá, Cordillera Oriental de Colombia. De acuerdo con la clasificación infragenérica de Bentham (1846) y sobre la base de la estructura del limbo de la corola y del número de estambres, la especie nueva es incluida en la sección *Schwenckia* por presentar dos estambres fértiles, los lóbulos medios de la corola aciculares que no exceden en tamaño los lóbulos laterales contiguos, éstos últimos deltoideos y ligeramente emarginados.

Schwenckia alvaroana Benítez, sp. nov. TIPO: Colombia. Caquetá: Mun. San Vicente de Caguán, carr. entre Neiva y San Vicente, sect. La Danta, Cordillera Oriental, Vertiente Oriental, 589 m, 3 dic. 1990, *J. Betancur, S. Churchill & A. Wills 2378* (holótipo, MO; isótipo, HUA). Figura 1.

Species proxima *S. americanae* ejusdem sectionis *Schwenckia*, staminibus 2 praesentibus, staminodiis sensim minoribus, corollis morphologice correlatis, foliisque per caulem solitarie distributis. Differt vero: corolla 5–7.5 mm (non 9–13 mm) longa, calyce dense pubescenti (non laxe pubescenti), habitu scandente (non erecto, e basi ramoso vel non, caulibus erectis vel procumbentibus).

Planta trepadora, aparentemente muy voluble, tallos glabros. Hojas solitarias; lámina ovada, 7–12 × 2.5–4.5 cm, atenuada y aguda en el ápice, trunca o redondeada en la base, margen entero, glabra en ambas caras excepto a lo largo del nervio principal y laterales, donde se presentan tricomas simples, uniseriados, ascendentes y dispersos; venas laterales en número de 5 a 6/lado, convergentes y enlazadas hacia el margen; pecíolos 0.6–1.2 mm de largo, 1 mm de grueso, ligeramente encorvados, adpreso-ascendente-pubescentes, tricomas simples uniseriados. Inflorescencias axilares, racemiformes, de 4–8 cm de largo, multifloras, pedúnculos de 0.9–1.2 cm de largo. Flores solitarias o en pares, bracteadas, brácteas filiformes, de 1–2 mm de largo, pediceladas, pedicelos 1–1.5 mm de largo, con tricomas simples uniseriados ascendentes, cáliz 3–4.5 mm de largo, tubular, externamente densamente pubescente, tricomas simples uniseriados, ascendentes, glabro en su parte interna, 5 lobado, los lóbulos 0.5–1.5 mm de largo; corola verdosa, erecta, tubular-infundibuliforme,

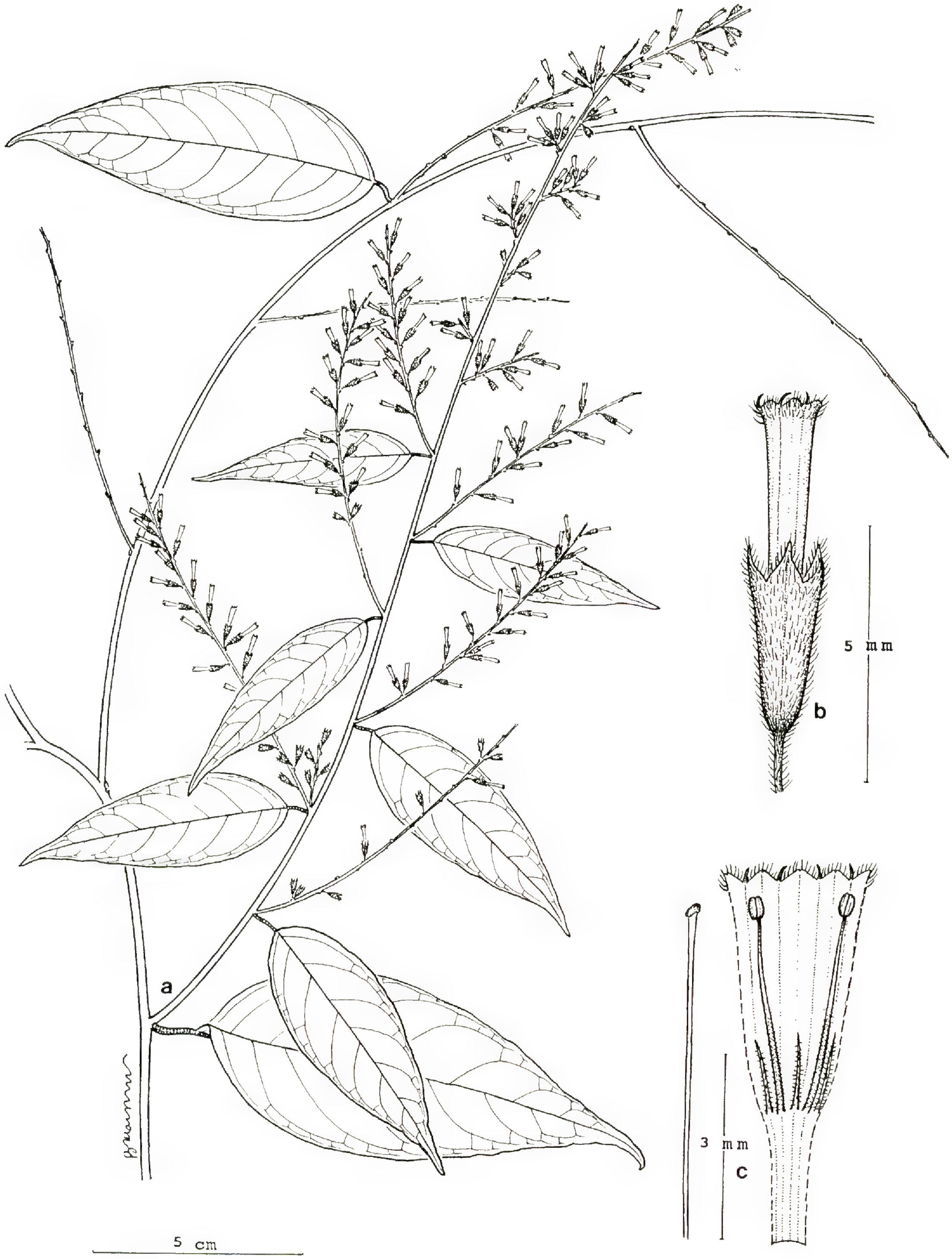

Figura 1. —a. Rama florífera. —b. Vista lateral de la flor. —c. Sección longitudinal de la corola y el estilo. Basada en *J. Betancur, S. Churchill & A. Wills 2378.*

angostada hacia la base, a nivel del ovario ligeramente ensanchada, el tubo 5–6 mm de largo, glabro, 5-lobado, lobos laterales contiguos deltoideos, con 3 a 5 lóbulos medios aciculares, casi del mismo tamaño que los lobos laterales contiguos, estos ligeramente emarginados y pilosos; estambres fértiles 2, insertos en el tubo de la corola, pilosos, filamentos 4.2–4.9 mm de largo, laminares, parte

adnata 2 mm de largo, parte libre 2.2–2.9 mm de largo, estaminodios representados únicamente por el filamento de 2.1–2.4 mm de largo, anteras 0.5 mm diám., oblongas; estilo 4.5 mm de largo, glabro, porción estigmática subglobosa. Fruto no visto.

Schwenckia alvaroana se distingue por su hábito trepador, por presentar 2 estambres acompañados de 3 estaminodios, estos apreciablemente menores en tamaño que los estambres y por poseer sus corolas de tamaños menores con respecto al resto de las especies de la sección, a saber: *S. americana* L. var. *americana* Carvalho, *S. americana* L. var. *macedo* Carvalho, *S. elegans* Carvalho, *S. glabrata* Kunth, *S. huberi* Benítez y *S. novaveneciana* Carvalho.

Está relacionada con *Schwenkia americana* L. var. *americana*, por la presencia de 2 estambres, acompañados por estaminodios apreciablemente menores en tamaño que el de los estambres, por similitud morfológica de sus corolas y por presentar la hojas solitarias. Se diferencian por el largo de la corola, que en *S. alvaroana* mide 5–7.5 mm, mientras que en *S. americana* la corola mide 9–13 mm de largo. Así mismo en *S. alvaroana* el cáliz es densamente pubescente, mientras que en *S. americana* es laxo pubescente. Finalmente *S. alvaroana* es de hábito trepador, mientras que *S. americana* var. *americana* es una hierba erecta, ramificada o no desde la base y con tallos erectos o inclinados.

Clave de las Especies de *Schwenckia* secc. *Schwenckia*

1a. Hojas fasciculadas, corola recta.
  2a. Flores fasciculadas; cáliz 4 mm de largo; corola 10–13 mm de largo . . . . . *Schwenckia elegans* Carvalho
  2b. Flores solitarias; cáliz 2–3 mm de largo; corola 10 mm de largo . . . . . *Schwenckia novaveneciana* Carvalho
1b. Hojas solitarias, corola cúrvula o erecta.
  3a. Pedicelo floral 2–4 mm de largo; corola 9–15 mm de largo.
    4a. Plantas glabrescentes o laxamente pilosas.
      5a. Corola cúrvula; estaminodios de igual tamaño que los estambres. Hojas solitarias . . . . . *Schwenckia glabrata* Kunth
      5b. Corola erecta; estaminodios conspicuamente mucho más cortos que los estambres. Hojas fasciculadas.
        6a. Pedicelo articulado, mayor o igual a 2 mm largo; cáliz piloso en ambas caras . . . . . *Schwenckia americana* var. *americana* Carvalho
        6b. Pedicelo no articulado, menor o igual a 2 mm de largo; cáliz piloso en la cara externa . . . . . *Schwenckia americana* var. *macedo* Carvalho
    4b. Plantas densamente pubescentes . . . . . *Schwenckia huberi* Benítez
  3b. Pedicelo floral 1–1.5 mm de largo; corola erecta, 5–7.5 mm de largo . . . . . *Schwenckia alvaroana* Benítez

Distribución y ecología. *Schwenckia alvaroana* es conocida del Sector La Danta del Municipio San Vicente de Caguán, Departamento del Caquetá, creciendo en afloramientos de rocas silicicásticas del Cretáceo, a 580 m de elevación. En esta región del Caquetá se han identificado numerosas especies endémicas de otras familias, sin embargo mientras no se conozcan otros especímenes de esta especie podría considerársele restringida al área de hallazgo.

Etimología. Dedico esta especie nueva a Alvaro Idárraga-Piedrahita, botánico colombiano (HUA), quien con sus inventarios florísticos ha contribuido al conocimiento de la fitodiversidad colombiana.

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Literatura Citada

Benítez de Rojas, C. E. 1993. La Tribu *Schwenckieae* A. Hunz. (Solanaceae) en Venezuela. Universidad Central de Venezuela, Consejo de Desarrollo Científico y Humanístico Caracas, Gráfica León, S.R.L.

Bentham, G. 1846. Scrophulariaceae, Trib. 1 Salpiglossideae. *In:* A. P. de Candolle (editor), Prodr. 10: 190–203. L. Masson, Paris.

Carvalho, L. d' A. Freire de. 1978a. O gênero *Schwenckia* D. Van Rooyen ex L. no Brasil (Solanaceae). Rodriguésia 44: 307–524.

———. 1978b. Novidades en *Schwenckia* D. Van Rooyen ex L.—Solanaceae. Especies novas: *Schwenckia nova-veneciana* Carvalho, *Schwenckia americana* var *macedo* Carvalho e *Schwenckia grandiflora* var *hatschbachiana* Carvalho. Arq. Jard. Bot. Rio de Janeiro 12: 145–161.

Hunziker, A. T. 2001. The Genera of Solanaceae. A. R. G. Gantner Verlag K.G.

Three New Species of *Actinocephalus* Sano (Eriocaulaceae) from Minas Gerais, Brazil

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Abstract. Three new species of Eriocaulaceae belonging to genus *Actinocephalus* (Körnicke) Sano are recognized: *Actinocephalus aggregatus* F. N. Costa, *A. deflexus* F. N. Costa, and *A. graminifolius* F. N. Costa. These species are endemic to the Serra do Cipó, Minas Gerais, Brazil. They are placed in *Actinocephalus* based on the presence of the inflorescences composed of capitula in umbels, besides other floral and vegetative characteristics common to the genus. Comments about habitat and geographic distribution of the species are also presented.

Resumo. Três espécies novas de Eriocaulaceae pertencentes ao gênero *Actinocephalus* (Körnicke) Sano são descritas: *Actinocephalus aggregatus* F. N. Costa, *A. deflexus* F. N. Costa e *A. graminifolius* F. N. Costa. Estas espécies são endêmicas da Serra do Cipó, Minas Gerais, Brasil. Elas foram alocadas em *Actinocephalus* baseado na presença de inflorescências compostas por capítulos em umbelas, além de outras características florais e vegetativas comuns ao gênero. Também são apresentados comentários sobre o habitat e a distribuição geográfica das espécies.

Key words: *Actinocephalus*, Brazil, Eriocaulaceae, taxonomy.

Eriocaulaceae are a monocot family with 11 genera and approximately 1200 species (Giulietti & Hensold, 1990; Stützel, 1998). Most species are Neotropical, and the majority of genera and species are concentrated in the mountainous regions of Venezuela and west-central and southeastern Brazil in South America (Giulietti & Hensold, 1990; Hensold, 1991). A major center of species diversity is in the rocky meadows (campos rupestres) of the Cadeia do Espinhaço in the State of Minas Gerais (Giulietti & Hensold, 1990; Hensold & Giulietti, 1991).

Actinocephalus (Körnicke) Sano was proposed by Sano (2004), who elevated *Paepalanthus* sect. *Actinocephalus* (Körnicke) Ruhland to the generic category. According to Sano (2004), the genus *Actinocephalus* can be distinguished from other genera of Eriocaulaceae by the presence of inflorescences with an umbellate arrangement of capitula. Many species belonging to *Paepalanthus* subsect. *Aphorocaulon* Ruhland, such as *Paepalanthus incanus* (Bongard) Körnicke and *P. phaeocephalus* Ruhland, also have capitula in an umbelliform arrangement, although these inflorescences have been designated as "inflorescences in fascicle" by Ruhland (1903). The species of *P.* subsect. *Aphorocaulon* have other characters similar to *Actinocephalus*, such as presence of paraclades covered by foliage bracts, flowers trimerous, and staminodes squamiform in the pistillate flowers. The similarity between *Actinocephalus* and *P.* subsect. *Aphorocaulon* had been already discussed by Ruhland (1903: 26) and Sano (2004). Research in this subsection is being carried out by me, and the majority of the species belonging to *P.* subsect. *Aphorocaulon* will be included in *Actinocephalus*.

Actinocephalus now comprises 31 species restricted to Brazil, occurring mainly at the Cadeia do Espinhaço of Minas Gerais and Bahia.

Actinocephalus aggregatus F. N. Costa, sp. nov. TYPE: Brazil. Minas Gerais: Congonhas do Norte, Serra Talhada, acesso por um ramo vicinal à esquerda da estrada para Gouveia, 17 June 2000, *F. N. Costa & P. Fiaschi 191* (holotype, SPF; isotypes, B, G, K, MO). Figure 1A–D.

Rhizoma horizontale, multirosulatum. Folia apice comosa, margine longe ciliata, utrinque glabra. Inflorescentia bracteis involucralibus apice intus pilosis.

Perennial herb, 30–41 cm tall; rhizome horizontal to the ground, ramified, numerous rosettes per rhizome. Leaves rosulate, erect, coriaceous, linear, 1.5–3 × 0.1 cm, both surfaces glabrous, apex acute, densely ciliate, margins long ciliate, base sericeo-lanate; paraclades 1.5–9 cm long, 3 mm diam., glabrous; paracladial bracts patent, lanceolate, 1–1.5 × 0.2 cm, both surfaces glabrous, apex acute, mucronulate, margins with long trichomes, mainly at base, base semiamplexicaul, sericeo-lanate. Spathe 3 - 4.5 cm long, pubescent to glabrous, apex acute; scapes 1 to 7 per paraclade, 22–37 cm long, sericeous with appressed T-shaped trichomes; capitula 1 cm diam., globose to hemispheric. Involucral bracts

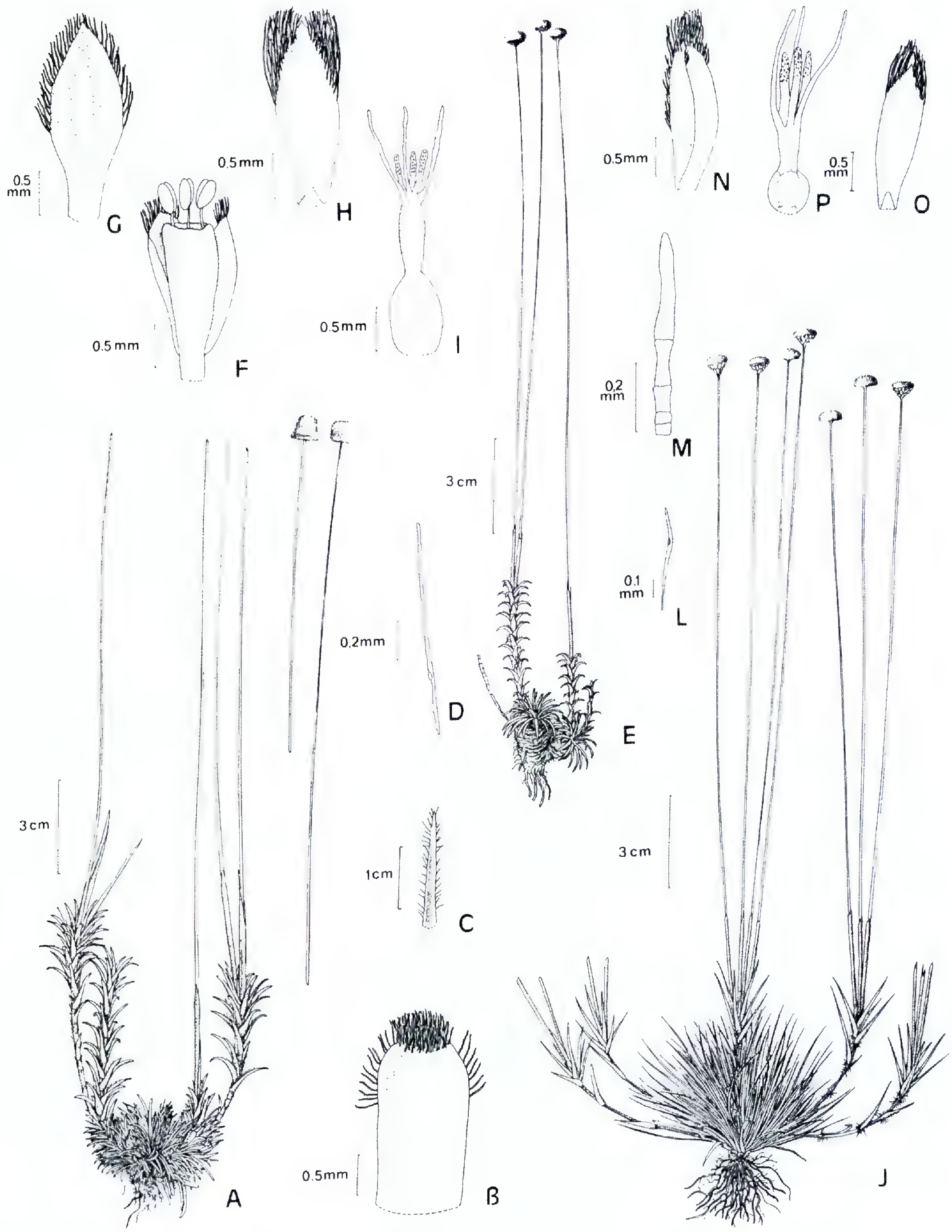

Figure 1. A–D. *Actinocephalus aggregatus* F. N. Costa. —A. Habit showing only one rosette. —B. Adaxial view of involucral bract. —C. Leaf, showing long ciliate margins. —D. T-shaped trichome of scape. Drawn from the type *F. N. Costa & P. Fiaschi 191* (SPF). E–I. *Actinocephalus deflexus* F. N. Costa. —E. Habit. —F. Staminate flower with one sepal removed. —G. Adaxial view of sepal of pistillate flower. —H. Adaxial view of petal in pistillate flower showing staminode squamiform. —I. Gynoecium showing styles and appendage. Drawn from the type *F. N. Costa & P. Fiaschi 207* (SPF). J–P. *Actinocephalus graminifolius* F. N. Costa. —J. Habit. —L. T-shaped trichome of scape. —M. Trichomes with ornamentation internal of sepal of staminate flower. —N. Sepal of pistillate flower. —O. Adaxial view of petal in pistillate flower showing staminode squamiform. —P. Gynoecium presenting styles and appendages. Drawn from from the type *F. N. Costa, L. R. Lima, C. A. G. Santos, V. L. Scatena, M. M. Rosa & A. I. Coan 51* (SPF).

brown, oblong, ca. 4 × 1.7 mm, adaxial surface pubescent at apex, apex obtuse, ciliate at upper margin, trichomes with ornamentation internal; receptacle conical, densely pubescent. Flowers ca. 600 per capitulum, ca. 400 staminate and 200 pistillate within a single capitulum; floral bracts oblong, ca. 2.4 × 0.3 mm, apex acute, ciliate at upper margin and densely ciliate at apex, trichomes with ornamentation internal; staminate flowers ca. 3 mm long; pedicel ca. 0.7 mm long, glabrous; sepals obovate, ca. 2 × 0.7 mm, apex obtuse, ciliate at upper margin and densely ciliate at apex, trichomes with ornamentation internal; corolla tubular, smooth, base of the corolla conspicuously carnose, ca. 2 mm long, 6-lobed; stamens ca. 1.5 mm long; pistillodes with apex covered with papillose trichomes; pistillate flowers ca. 3 mm long, sessile; sepals elliptic, ca. 2.8 × 0.8 mm, apex acute, ciliate at upper margin and densely ciliate at apex, trichomes with ornamentation internal; petals narrowly elliptic, ca. 2.5 × 0.6 mm, apex acute, abaxial surface densely pubescent, ciliate at upper margin except at apex, trichomes present but without ornamentation internal; staminodes squamiform, opposite petals, ca. 0.2 mm long; appendage ca. 1.2 mm long, cylindrical, apex covered by papillose trichomes.

The diagnostic features of *Actinocephalus aggregatus* are as follows: the presence of numerous aggregate rosettes, rhizomes usually very well developed and horizontal to the ground, leaves with apex densely ciliate and margins with long trichomes, paracladial bracts with margins long ciliate, especially at base, and involucral bracts pubescent at the adaxial surface.

Habitat, distribution, and phenology. *Actinocephalus aggregatus* is restricted to the northern part of Serra do Cipó from 1250 to 1400 m in elevation at the Cadeia do Espinhaço in Minas Gerais. It is rarely collected due to its limited range, which is difficult to access. Flowering specimens were collected in March and June, occurring in campos rupestres.

Etymology. The epithet "aggregatus" is in reference to the numerous aggregate rosettes found in this species.

Paratype. BRAZIL. **Minas Gerais:** Fechados, Serra do Cipó, in valleys of Córrego dos Piões and Córrego Soberbo, ca. 5 km S of Rio Preto, 18 53′50″–55′30″S, 43 44′50″–46′00″W, 1250–1400 m alt., 22 Mar. 1982, *N. Hensold 565* (SPF).

Actinocephalus deflexus F. N. Costa, sp. nov. TYPE: Brazil. Minas Gerais: Santana de Pirapama, Serra do Cipó, Fazenda dos Inhames, trilha para o alto da serra, ca. 43 46′W, 18 57′S, 20 June 2000, *F. N. Costa & P. Fiaschi 207* (holotype, SPF; isotype, MO). Figure 1E–I.

Folia deflexa, linearia, supra tomentosa deinde glabrescentia, subtus glabra. Bracteae paracladiales deflexae, trichomatibus longis ad marginem praecipue prope basem.

Perennial herb, 25–38 cm tall; rhizome vertical or horizontal to the ground, ramified, 1 to 3 rosettes per rhizome. Leaves rosulate, deflexed, coriaceous, linear, 0.8–1.7 × 0.1–0.2 cm, adaxial surface tomentose to glabrescent, abaxial surface glabrous, apex acute, densely ciliate, margins glabrous, base sericeo-lanate; paraclades 3.0–8.0 cm long, 1.5 mm diam., glabrous; paracladial bracts deflexed, lanceolate to linear, ca. 1 × 0.1–0.2 cm, both surfaces glabrous, apex acute, densely ciliate, margins with long trichomes, mainly at base, base semiamplexicaul, sericeo-lanate. Spathe 2–2.5 cm long, tomentose to glabrescent, apex acute; scapes 1 to 14 per paraclade, 13–31 cm long, sericeous with appressed T-shaped trichomes; capitula 0.7 cm diam., hemispheric; involucral bracts brown, oblong to ovate, ca. 3 × 1.8 mm, apex obtuse, ciliate at upper margin and densely ciliate at apex, trichomes with ornamentation internal; receptacle hemispheric, pubescent. Flowers ca. 132 per capitulum, ca. 108 staminate and 24 pistillate in a single capitulum; floral bracts narrowly oblong, ca. 1.5 × 0.3 mm, apex acute, ciliate at upper margin and densely ciliate at apex, trichomes with ornamentation internal; staminate flowers ca. 2.4 mm long; pedicel ca. 0.7 mm long, glabrous; sepals oblanceolate, ca. 1.6 × 0.5 mm, apex acute, ciliate at upper margin and densely ciliate at apex, trichomes with ornamentation internal; corolla tubular, smooth, base of the corolla conspicuously carnose, ca. 1.6 mm long, 6-lobed; stamens ca. 1.2 mm long; pistillodes with apex covered with papillose trichomes; pistillate flowers ca. 2.3 mm long, sessile; sepals elliptic, ca. 2 × 1 mm, apex acute, margins apically ciliate, apex densely ciliate, trichomes with ornamentation internal; petals narrowly elliptic, ca. 2.3 × 0.6 mm, ciliate at upper margin except at apex, trichomes without ornamentation internal, apex acute; staminodes squamiform, opposite petals, ca. 0.2 mm long; appendage ca. 0.5 mm long, cylindric, apex covered with papillose trichomes.

Actinocephalus deflexus can be distinguished from other species belonging to genus by the following combination of features: leaves deflexed, linear, adaxial blade surface tomentose to glabrescent, and paracladial bracts that are deflexed with long trichomes at margins.

Habitat, distribution, and phenology. *Actinocephalus deflexus* is restricted to the northern Serra do Cipó at the Cadeia do Espinhaço, Minas Gerais. Flowering noted in April and June in campos rupestres at elevations of 1150–1300 m.

Etymology. The epithet "deflexus" is in reference to the leaves and paracladial bracts deflexed found in this species.

Paratype. BRAZIL. **Minas Gerais:** Fechados, Serra do Cipó, SW of Congonhas do Norte, boundary hillside with sandy brejo below, just S of Rio Preto E of Córrego dos Piões, 22 Apr. 1982, *N. Hensold 739* (SPF).

Actinocephalus graminifolius F. N. Costa, sp. nov. TYPE: Brazil. Minas Gerais: Santana do Riacho, Serra do Cipó, rod. Belo Horizonte–Conceição do Mato Dentro, km 139, um pouco antes da bifurcação, 27 July 1999 (fl), *F. N. Costa, L. R. Lima, C. A. G. Santos, V. L. Scatena, M. M. Rosa & A. I. Coan 51* (holotype, SPF; isotypes, B, K, MO). Figure 1J–P.

Rhizoma erectum. Folia erecta, membranacea, linearia. Paracladia tenuia, pubescentia; bracteis paracladialibus linearibus.

Perennial herb, 26–31 cm tall; rhizome vertical to the ground, not ramified, one single rosette per rhizome. Leaves rosulate, erect, membranaceous, linear, 4–7 × 0.1 cm, adaxial surface sericeous to glabrescent, abaxial surface glabrescent, apex acute, margins long ciliate, base sericeo-lanate; paraclades 5–7.5 cm long, 0.8 mm diam., pubescent; paracladial bracts ascending, linear, 1.5–3.5 × 0.1–0.2 cm, indument similar to the leaves, apex acute, margins with long trichome, base semiamplexicaul, sericeo-lanate. Spathe 3–4 cm long, puberulent, apex acute; scapes 2 to 6 per paraclade, 16–26 cm long, sericeous with appressed T-shaped trichomes; capitula 0.6 cm diam., obconic; involucral bracts brown, oblong-obovate, ca. 2.4 × 1.3 mm, adaxial surface glabrous, abaxial surface glabrescent, apex obtuse, ciliate at upper margin, densely ciliate at apex, trichomes with ornamentation internal; receptacle hemispheric, densely hairy. Flowers ca. 107 per capitulum, ca. 80 staminate and 27 pistillate in a single capitulum; floral bracts oblong, ca. 2 × 0.5 mm, apex acute, ciliate at upper margin, densely ciliate at apex, trichomes with ornamentation internal; staminate flowers ca. 2.6 mm long; pedicel ca. 0.4 mm long, glabrous; sepals obovate, ca. 1.6 × 0.5 mm, apex acute, ciliate at upper margin, densely ciliate at apex, trichomes with ornamentation internal; corolla tubular, smooth, base of the corolla conspicuously carnose, ca. 2 mm long, 6-lobed; stamens ca. 1.5 mm long; pistillodes with apex covered with papillose trichomes; pistillate flowers ca. 2.2 mm long; sessile or with pedicel ca. 0.5 mm long, glabrous; sepals obovate, ca. 2 × 1 mm, apex acute to rounded, ciliate at upper margin, apex densely ciliate, trichomes with ornamentation internal; petals elliptic, ca. 1.9 × 0.6 mm, ciliate at upper margin except apex, trichomes with ornamentation internal, apex of petal acute; staminodes squamiform, opposite petals, ca. 0.2 mm long; appendage ca. 1 mm long, cylindric, apex covered with papillose trichomes.

Actinocephalus graminifolius can be distinguished from other species of *Actinocephalus* by the presence of linear and membranaceous leaves and thin paraclades.

Habitat and distribution. *Actinocephalus graminifolius* occurs in campos rupestres, typically among Gramineae, Velloziaceae, Cyperaceae, and other species of Eriocaulaceae, and, at the moment, is known only from the type, collected to the south of Serra do Cipó at the Cadeia do Espinhaço in Minas Gerais.

Etymology. The epithet "graminifolius" is in reference to the long and linear leaves, similar to leaves of Gramineae.

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Literature Cited

Giulietti, A. M. & N. Hensold. 1990. Padrões de distribuição geográfica dos gêneros de Eriocaulaceae. Acta Bot. Brasil. 4: 133–157.

Hensold, N. 1991. Revisionary studies in the Eriocaulaceae of Venezuela. Ann. Missouri Bot. Gard. 78: 424–440.

——— & A. M. Giulietti. 1991. Revision and redefinition of the genus *Rondonanthus* Herzog (Eriocaulaceae). Ann. Missouri Bot. Gard. 78: 441–459.

Ruhland, W. 1903. Eriocaulaceae. *In:* A. Engler (editor), Das Pflanzenreich, 30. Engelmann, Leipzig.

Sano, P. T. 2004. *Actinocephalus* (Körn.) Sano (*Paepalanthus* sect. *Actinocephalus*), a new genus of Eriocaulaceae, and other taxonomic and nomenclatural changes involving *Paepalanthus* Mart. Taxon 53: 99–107.

Stützel, T. 1998. Eriocaulaceae. Pp. 197–207 *in* K. Kubitzki (editor), The Families and Genera of Vascular Plants IV—Flowering Plants: Monocotyledons—Alismatanae and Commelinanae (except Gramineae). Springer-Verlag, Berlin.

Oresbia, a New South African Genus of the Asteraceae, Senecioneae

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Abstract. *Oresbia heterocarpa* Cron & B. Nordenstam (Asteraceae, Senecioneae) is described as a new genus and species from South Africa. Until now the species has been known as *Cineraria tomentosa* Lessing, although first described as *Senecio lanatus* L. f. Both of these names are illegitimate. Characteristic features of *Oresbia* are the perennial habit with sessile, non-pinnatifid leaves, which are densely tomentose below, and the heteromorphic cypselae with four-winged ray-floret cypselae. The closest affinities of *Oresbia* may be with *Phaneroglossa* B. Nordenstam and possibly also *Lamprocephalus* B. Nordenstam, which have similar distribution ranges in the Western Cape mountains.

Key words: Asteraceae, Compositae, *Oresbia*, Senecioneae, Western Cape Province.

Ongoing taxonomic studies on the genus *Cineraria* L. have revealed the heterogeneous nature of the genus as traditionally circumscribed, and several elements have to be removed in order to achieve monophyly (Cron, 2005; Cron et al., in prep.). Two species are transferred to and another reinstated in *Senecio* L. (Cron, 2005; Cron et al., in press), and a fourth has been matched to *Mesogramma apiifolium* DC. (Nordenstam & Cron, in prep.). Another two are placed in a new genus *Bolandia* Cron, as *B. pedunculosa* (DC.) Cron and *B. argillacea* (Cron) Cron (Cron et al., 2006). The present paper deals with yet another misplaced taxon, which is described as a new monotypic genus.

Oresbia heterocarpa Cron & B. Nordenstam, gen. et sp. nov. TYPE: South Africa. Western Cape: Waterkloof Gorge, W of Ceres, 30 Sep. 1928, *J. Hutchinson & N. S. Pillans 576* (holotype, K; isotypes, BM, BOL, PRE). Figures 1–4; Hutchinson, 1946: 116, drawing.

Herba perennis erecta tomentosa vel araneosa. Folia alterna sessilia elliptica-ovata non pinnatifida herbacea, supra araneosa et glabrescentia, subtus albotomentosa, margine denticulata vel serrata leviter revoluta, apice acuta, basi semiamplexicaulia. Pedunculi terminales mono- vel oligocephali subnudi sparse bracteolati; capitula heterogama radiata sparse calyculata; involucri bracteae subuniseriatae lineari-lanceolatae venosae acuminatae; receptaculum planum vel subconvexum laeve. Flosculi radii feminei glabri flavi. Cypselae heteromorphae, radii glabrae quadrialatae; pappi setae barbellatae caducae. Flosculi disci hermaphroditi, corolla flava quinquelobata; lobis ovatis apice subcucullatis papillosis; antherae basi sagittatae vel breviter caudatae, collum filamenti basi dilatatum; styli rami intus areis stigmaticis separatis, apice truncati papillati. Cypselae disci exalatae, costis sex hirsutis; pappi setae numerosae barbellatae albae caducae.

Erect perennial herb, to about 30 cm tall; stems herbaceous, somewhat woody at the base, unbranched or branching sparingly near base, tomentose to cobwebby, glabrescent with age. Leaves cauline, alternate, sessile, narrowly obovate to elliptic or ovate, non-pinnatifid, lamina 16–66(−80) × 4–23(−28) mm, thickly cobwebby to glabrescent above, densely white-tomentose below; apex acute; margin dentate to serrate, revolute; leaf-base clasping, without auricles. Capitula heterogamous, radiate, usually in twos or threes (rarely as many as 11) per stem, occasionally solitary; peduncles 0.5–4 cm to point of branching, as long as 9 cm if unbranched, densely cobwebby, subtended by lanceolate bracts (1–2.5 cm long) and with smaller bracts along their length, distally nude; receptacle flat or slightly convex, glabrous; involucre widely campanulate to cup-shaped, calyculate with 4 to 7 linear-lanceolate calyculus bracts 2–4 mm long; phyllaries subuniseriate, 16 to 20, linear-lanceolate, (5.5–)6.5–7.5 mm long, cobwebby to tomentose, glabrescent toward the apex, 1- to 3-veined, acuminate, margins narrowly scarious. Ray florets 8 to 13, female, glabrous; tube 2.5–3 mm long, cylindrical; limb oblong, 5–12 mm, 4-veined, yellow. Disc florets hermaphroditic, 25 to 42; corolla tubular below, narrowly campanulate above, 5.0–6.2 mm long, yellow; corolla lobes triangular-ovate, 0.5–0.7 mm long, apically subcucul-

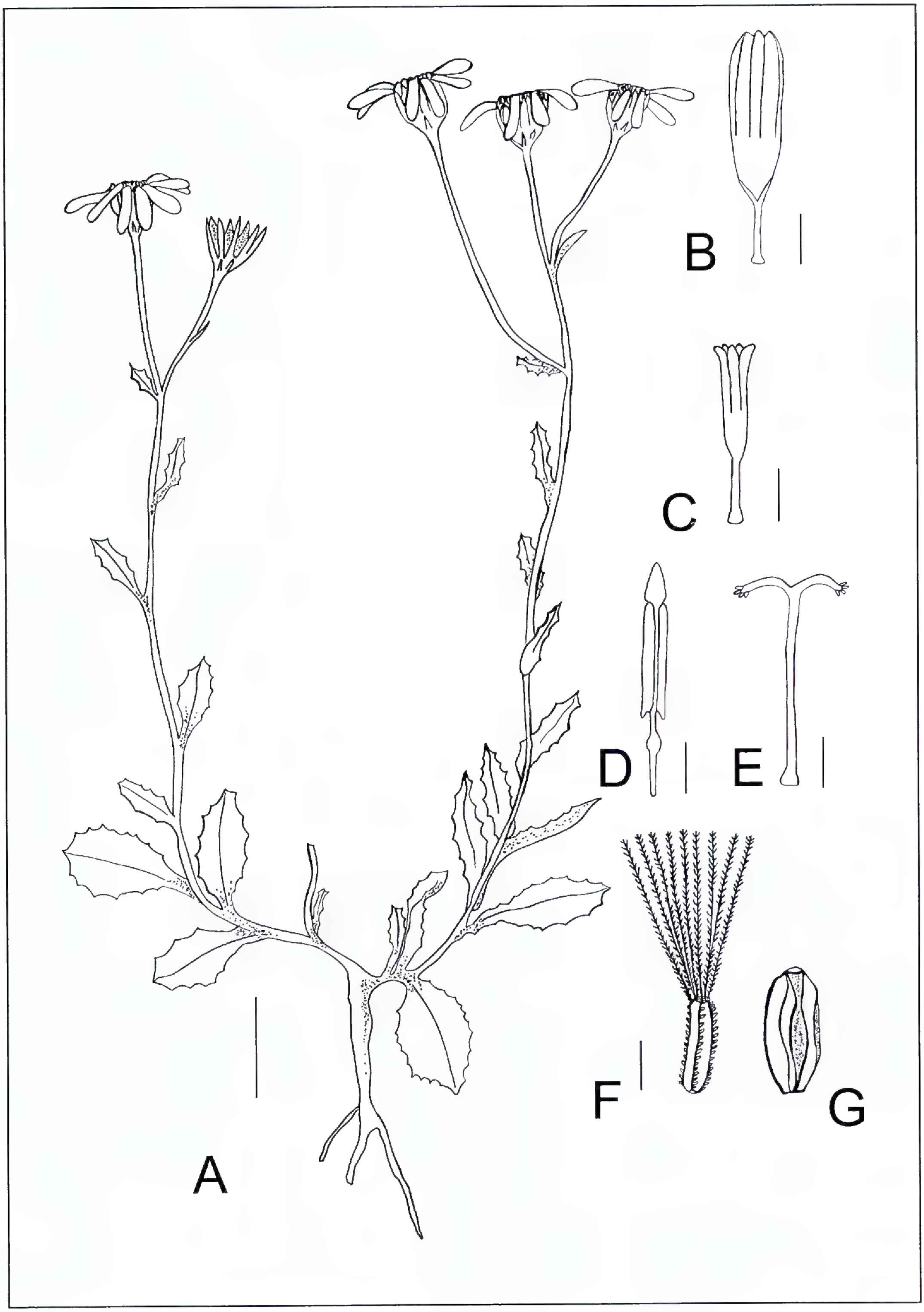

Figure 1. *Oresbia heterocarpa* Cron & B. Nordenstam. —A. Habit. —B. Ray floret. —C. Disc floret. —D. Anther. —E. Style. —F. Disc cypsela with pappus. —G. Ray cypsela (pappus not drawn). Scale bars: A = 16.5 mm; B = 1.8 mm; C, E = 1.9 mm; D = 0.9 mm; F, G = 1.2 mm. Drawn from *Cron, Hodgkiss, Stander & Cocks 322* (J).

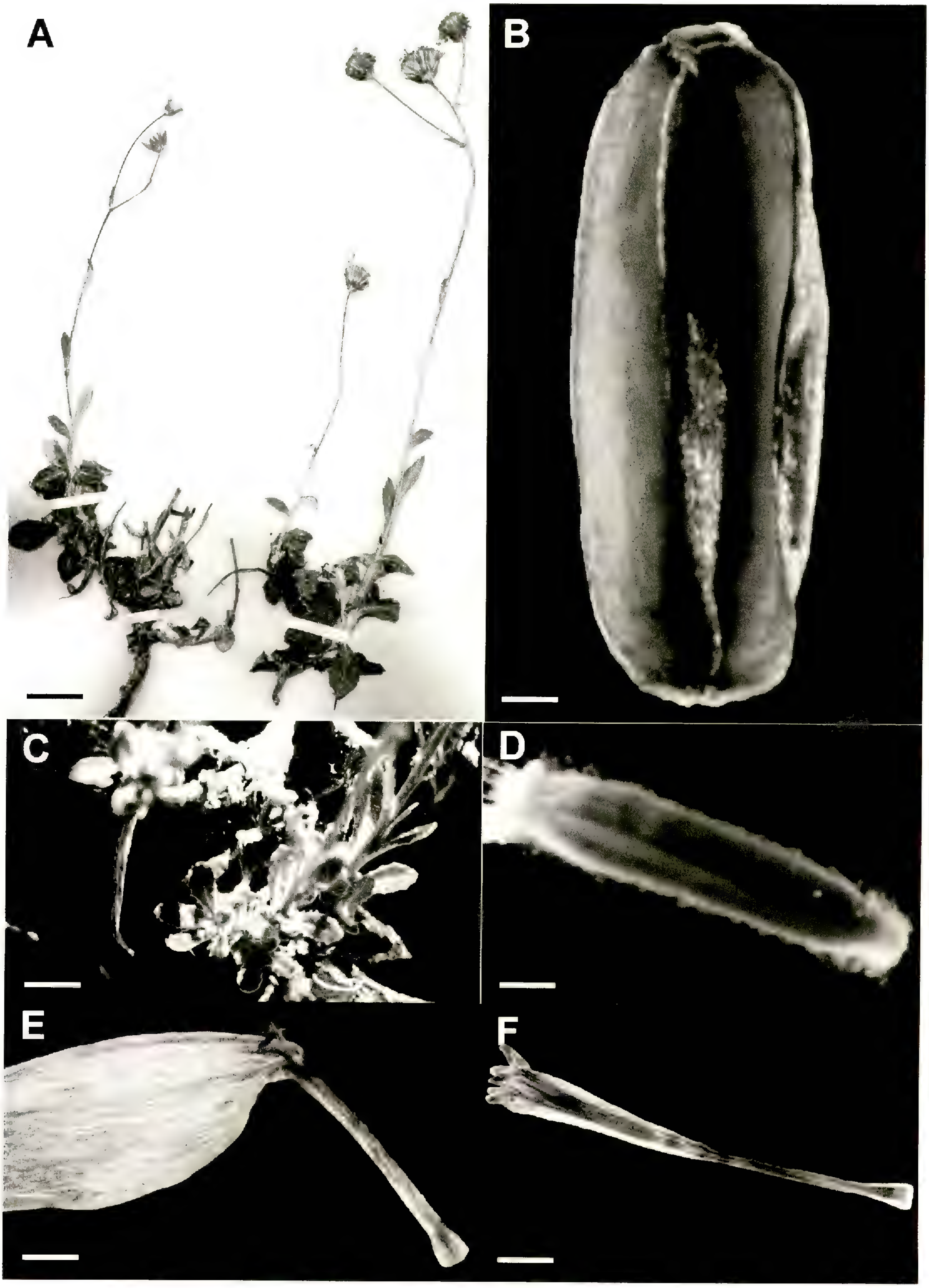

Figure 2. *Oresbia heterocarpa* Cron & B. Nordenstam. —A. Habit. Scale bar = 17 mm. —B. Four-winged ray cypsela. Scale bar = 250 µm. —C. Leaves. Scale bar = 20 mm. —D. Disc cypsela —mucilaginous trichomes have been triggered by wetting. Scale bar = 350 µm. —E. Ray floret tube and base of limb (lacking glandular hairs characteristic of *Cineraria*). Scale bar = 650 µm. —F. Disc floret. Scale bar = 830 µm. From *Cron, Hodgkiss, Stander & Cocks 322* (J).

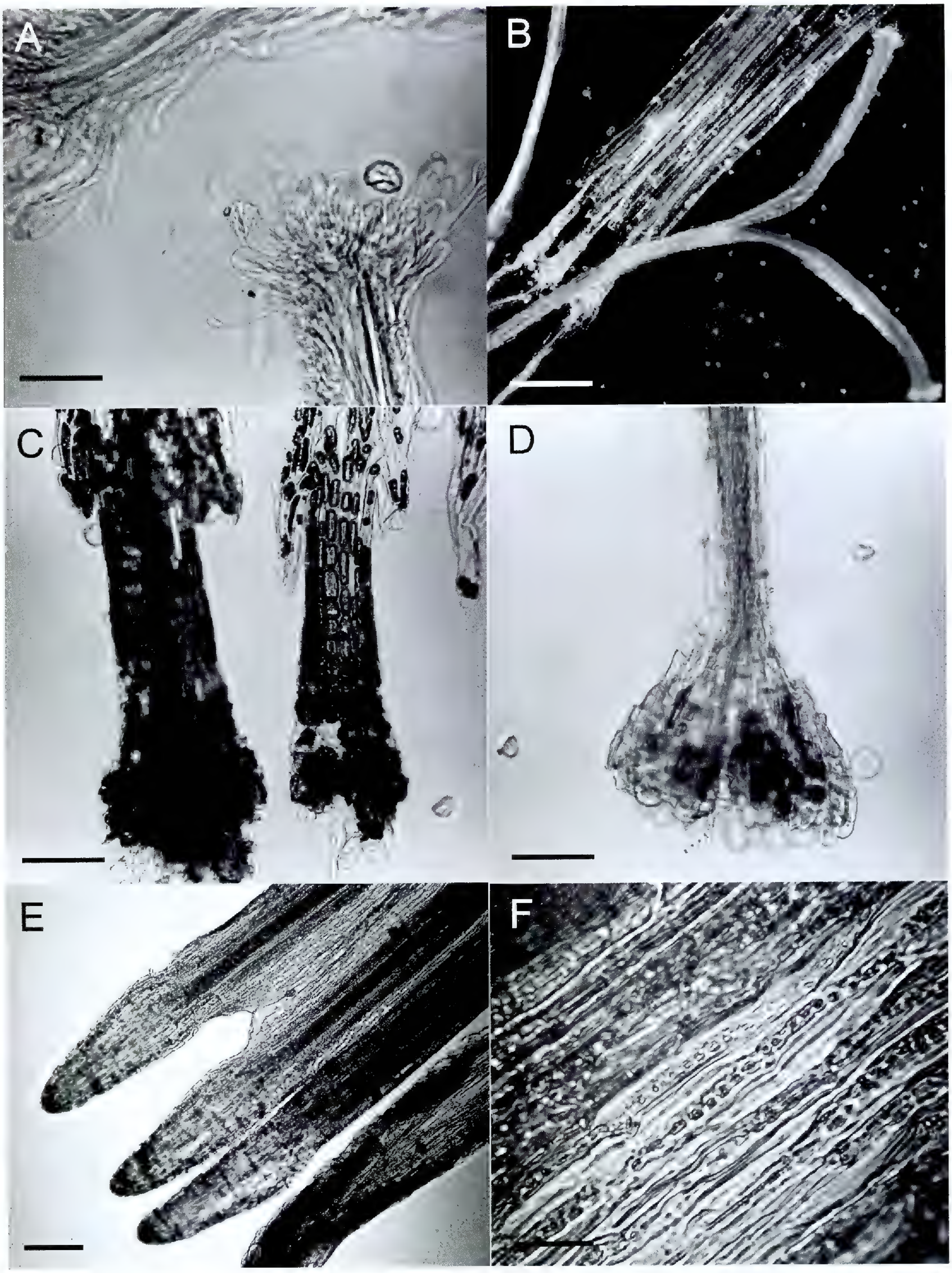

Figure 3. Light micrographs of florets of *Oresbia heterocarpa* Cron & B. Nordenstam. —A. Style apex. Scale bar = 50 µm. —B. Disc floret dissected to show stamens and style. Scale bar = 280 µm. —C. Balusterform filament collar and short anther tails. Scale bar = 150 µm. —D. Style base. Scale bar = 150 µm. —E. Anthers with anther appendages. Scale bar = 150 µm. —F. Endothecial thickening of radial (inner anticlinal) type. Scale bar = 50 µm. From *Cron et al. 322* (J).

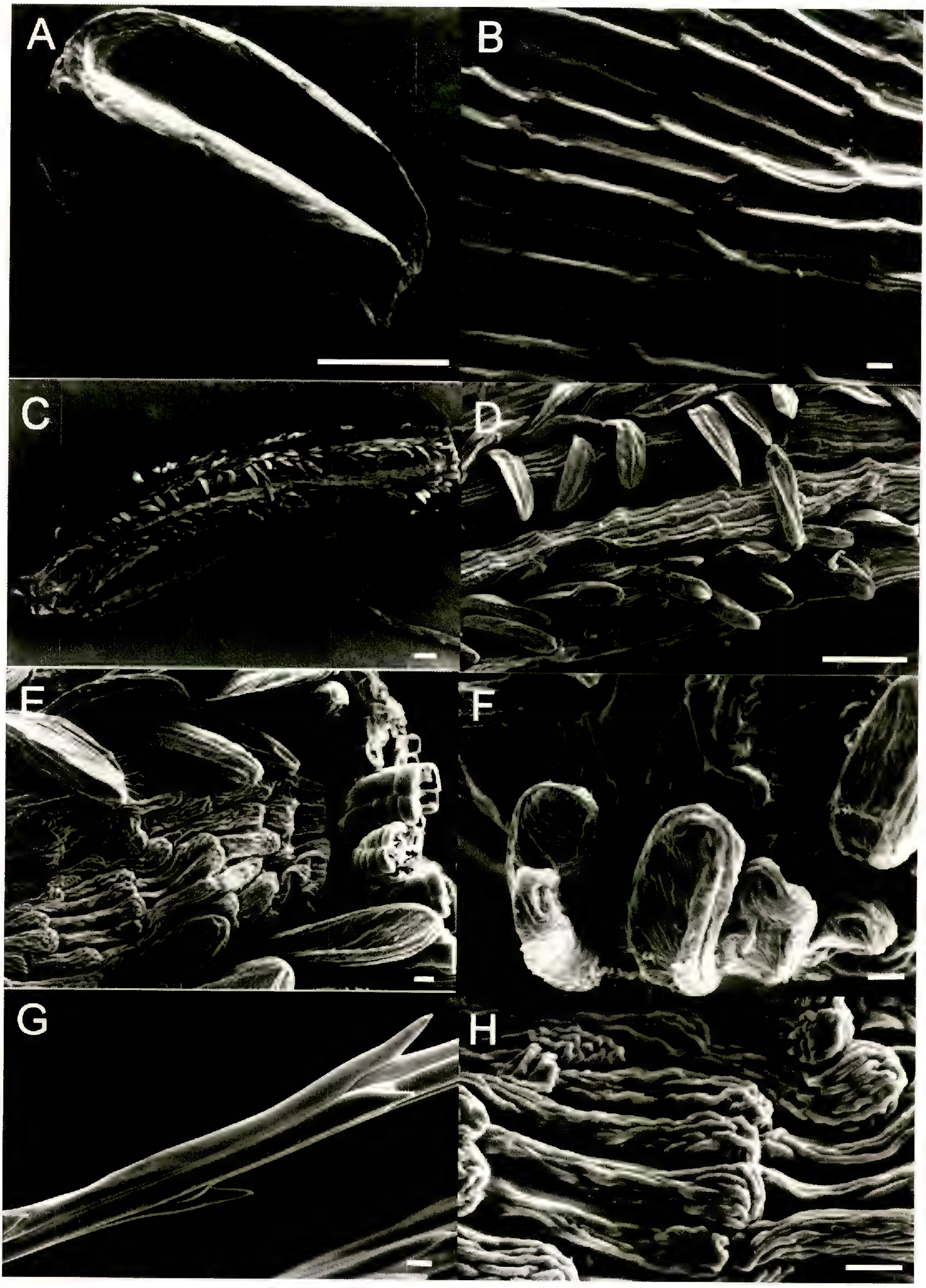

Figure 1. Scanning electron micrographs of cypselae of *Oreobia heterocarpa* Cron & B. Nordenstam. —A. Four-winged ray cypsela. Scale bar = 1 mm. —B. Epicarp surface of ray cypsela: smooth rectangular cells with raised walls. Scale bar = 10 µm. —C. Disc cypsela. Scale bar = 100 µm. —D. Ribs and trichomes of disc cypsela. Scale bar = 100 µm. —E. Stylopodium end of disc cypsela. Scale bar = 10 µm. —F. Base of disc cypsela (no carpopodium evident). Scale bar = 10 µm. —G. Pappus bristles. Scale bar = 10 µm. —H. Detail of epicarp surface of disc cypsela: striate elongate cells with rounded ends. Scale bar = 10 µm. From *Cron et al. 322* (J).

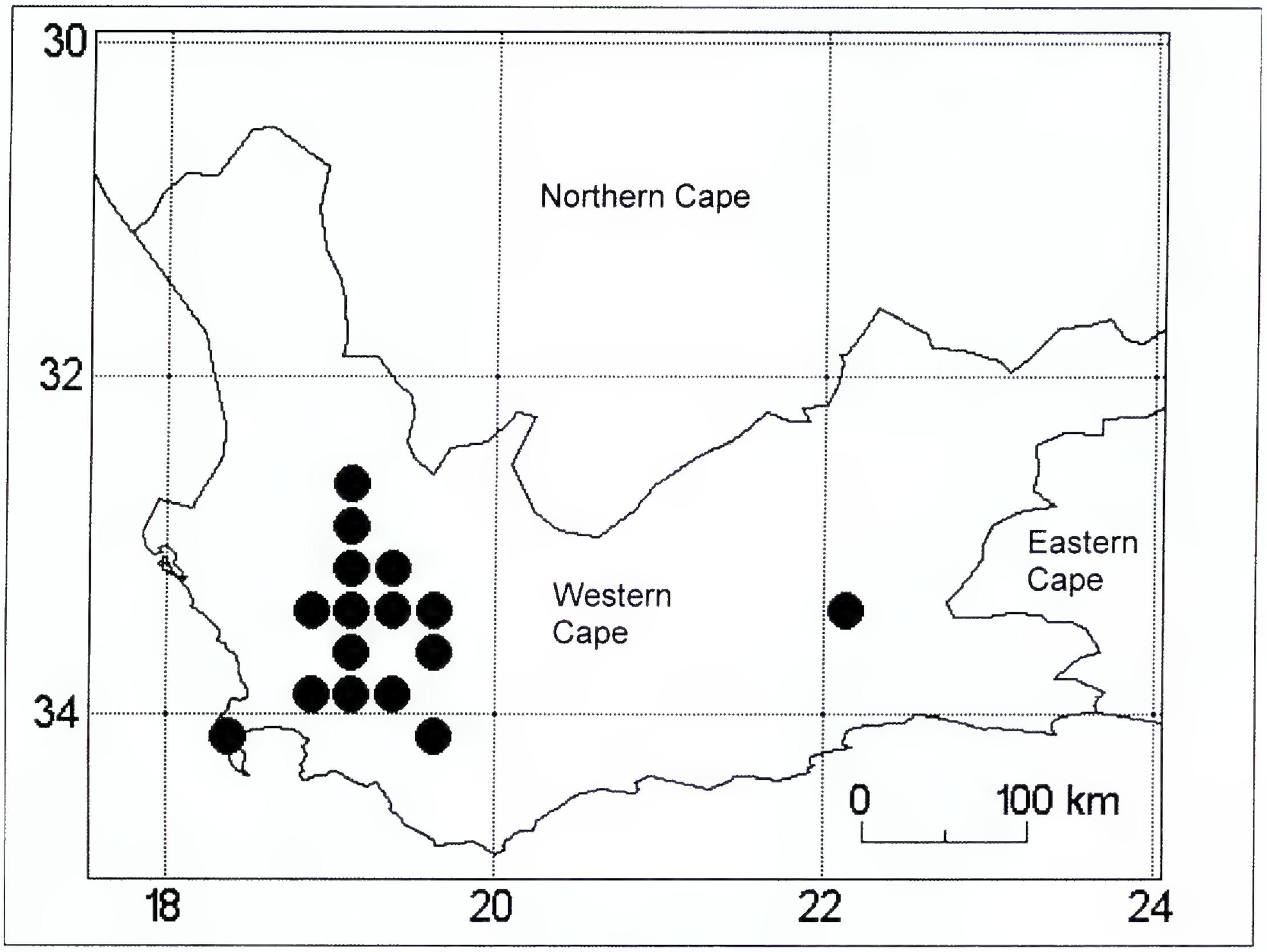

Figure 5. Known distribution of *Oresbia heterocarpa* Cron & B. Nordenstam.

late and minutely papillate; anthers basally sagittate or shortly caudate; apical appendage ovate, obtuse; endothecial tissue radial; filament collar distinctly balusterform; style branches with separate stigmatic areas; apex truncate with short sweeping hairs, outside glabrous. Cypselae heteromorphic: ray cypselae 4-winged, glabrous, brown to reddish brown, 2.0–3.5 mm long; epicarp cells rectangular, smooth with raised ridges; disc cypselae oblong-cylindrical with 6 ribs, not compressed or margined or winged, 1.5–2.2 mm long, with mucilaginous twin hairs on ribs; epicarp cells with rounded ends, striate; carpopodium absent or obscure; pappus bristles pluriseriate, 4–5 mm long, barbellate, white, caducous.

Note. *Compton 13850* (NBG) has unusually large leaves (80 × 28 mm).

Phenology, distribution, habitat, and elevation. Flowering September to January, mainly in September and October, occasionally as early as August. Distributed in South Africa in the Western Cape, predominantly in the mountains around Franschhoek, Worcester, Paarl, Ceres, and Clanwilliam (Fig. 5). Growing in moist areas shaded by rocks or low shrubs, or at the edge of caves, on south-facing or southeastern slopes or below cliffs, on ledges, on Table Mountain Sandstone and on shale bands, 800–1700 m (–2100 m on the Matroosberg).

Conservation status. Not common, occurring in isolated, small populations or as solitary plants at high altitude on mountains. *Oresbia heterocarpa* is probably not threatened because of the altitude at which it occurs, and is considered Least Concern according to the IUCN (2001) criteria (J. Victor, pers. comm.).

Etymology. The generic name is derived from the Greek adjective *oresbius*, meaning "mountain-dwelling," and the specific epithet alludes to the heteromorphic cypselae.

Both names previously applied to *Oresbia heterocarpa* are illegitimate. The name *Senecio lanatus* was first used by Linnaeus (1759: 1216) for a different taxon (= *Senecio populifolius* L., = *S. halimifolius* L.), and so its use by Linné fil. (1782: 370) for the taxon here treated is illegitimate, as it is for *S. lanatus* Scopoli (1772: 165) and *S. lanatus* (Kunth) DC. (1838:

422) (= *S. tomentolanatus* Govaerts, 1999). Similarly, Miller (1768) first applied the name *Cineraria tomentosa* to a plant now known as *Senecio canadensis* L., which makes Lessing's (1832: 390) use of the name illegitimate. Lessing's (1832: 390) reference to Thunberg in connection with *Senecio lanatus* L. f. is an indirect reference to Linné fil., because Thunberg (1823: 681) refers to both Linné's *Supplementum Plantarum* (1782: 370) and the later *Systema Vegetabilium* per Gmelin (1796: 1229), as well as giving a description and the locality of the type specimen (*Thunberg 19593* (UPS)). (Thunberg contributed considerably to the completion of *Supplementum Plantarum* (1782), including about 500 new species from the Cape.)

This taxon is anomalous in *Cineraria* as pointed out by Harvey (1865: 308), who placed it in a subgenus of its own, *Senecioides* Harvey, distinct from his subgenus "*Eu-Cineraria*" by noncompressed glabrous winged cypselae and sessile undivided leaves. Harvey (1865: 308) adds, "quite unlike any other *Cineraria*." We certainly agree.

The new genus is probably most closely related to *Phaneroglossa* B. Nordenstam, which is another senecioid monotypic genus from the Western Cape mountains (Nordenstam, 1978: 66–70). Like *Oresbia*, *Phaneroglossa bolusii* (Oliver) B. Nordenstam has heteromorphic cypselae, those of ray florets being 5- to 6-winged and glabrous, and those of disc florets exalate but ridged and pubescent. In *Phaneroglossa* the capitula are, however, white-rayed, ecalyculate, and borne singly on long scapose peduncles. This close relationship is also supported by molecular evidence emerging in ongoing studies of the tribe (Pelser et al., in prep.). A phylogram based on ITS data places *Oresbia* basally in a supported clade with *Phaneroglossa* and *Dendrosenecio* (Hauman ex Hedberg) B. Nordenstam.

Another possible senecioid relative is *Lamprocephalus* B. Nordenstam, a further monotypic Western Cape genus with a similar distribution (Nordenstam, 1976). *Lamprocephalus montanus* B. Nordenstam is clearly distinct from *Oresbia* in several important characters such as the discoid ecalyculate capitula, strangely appendaged style branches with a continuous stigmatic surface, and homomorphic cypselae without wings or prominent ridges.

Paratypes. SOUTH AFRICA. **Western Cape:** Cederberg, Sneeuberg, *G. Cron, J. Hodgkiss, M. Stander & M. Cocks 322* (J, S); Piketberg Distr., Twenty-Four Rivers Mts. above Porterville, *Esterhuysen 16080* (BOL); Malmesbury Distr., Leliefontein, *N. S. Pillans 8828* (BOL); Paarl Distr., Berg River Hoek, *F. M. Leighton 2047* (BOL), *R. H. Compton 13850* (NBG), *Compton 18319* (NBG); Swartboskloof, *P. Van der Merwe 22 36* (PRE); Jonkershoek, *Esterhuysen 35489* (BOL, MO, S); Great Winterhoek, Tulbagh, *C. W. Thorne 51248* (SAM); Skurfteberg, near Grybouw, Ceres, *A. Bodkin 7550* (BOL, K, PRE); Ceres, Gydo Pass, *Compton 16221* (NBG); Ceres District, Eland's Kloof, *Esterhuysen 3284* (BOL, NBG); Tulbagh, *C. L. P. Zeyher s.n. sub SAM 16974*; Michell's Pass, *F. R. R. Schlechter 8940* (BM, K, PRE, WAG); Slab Peak, Michell's Pass, *Esterhuysen 6158* (BOL), *Compton 11956* (NBG), *T. P. Stokoe 57074* (SAM); Ceres, *M. R. Levyns 4658* (BOL), *Bolus s.n.* (BOL); Waaihoek Mt., *Esterhuysen 8336* (BOL); Matroosberg, *H. W. R. Marloth 2260* (PRE), *Esterhuysen 14189* (BOL), *Bolus 3955* (BOL); Slanghoek Needle, *Esterhuysen 17800* (BOL); Du Toit's Kloof, *Stokoe 63021* (SAM), *C. F. Drège s.n.* (P); Drakensteenbergen, *Drège 1739* (G-DC, P, S, SAM 50222); Eland's Kloof, off Du Toit's Kloof, *Esterhuysen 15271* (BOL); Franschhoek, *C. P. Thunberg 19593* (UPS-THUNB); Franschhoek Reserve, *Compton 5862* (BOL, NBG), *Compton 4182* (NBG); Franschhoek Peak, *Stokoe s.n.*, sub *SAM 60189*; Paarl Division, Sebastian's Kloof, *Stokoe 7270* (BOL); Paarl Division, April Peak, Wemmershoek Mts., *Esterhuysen 4128* (BOL); Louwshoek Mt., *Stokoe 60490* (SAM); Saw Edge Peak, *P. Goldblatt 4369* (MO, S); Swartberg Pass, Oudtshoorn, *Bolus 12022* (BM, BOL, K, P, PRE); Swartberg Pass, near Prince Albert, *Bolus 11557* (BOL, K, PRE); Simonstown Distr., Simonsberg, *Drège s.n.* (P); Caledon Distr., Wildepaardeberg, *Stokoe 2750* (BOL); Caledon Distr., Genadendal, *R. C. A. Prior s.n.* (K). *Sine loc.*: *Drège s.n.* (BM, MO).

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Literature Cited

Cron, G. V. 2005. *Cineraria* L. (Senecioneae, Asteraceae) — Its Taxonomy, Phylogeny, Phytogeography, and Conservation. Unpublished Ph.D. Thesis. University of the Witwatersrand, Johannesburg.

———, K. Balkwill & E. Knox. 2006. *Bolandia* (Asteraceae, Senecioneae): A new genus endemic to southern Africa. Novon 16: 224–230.

Gmelin, P. F. 1796. Caroli à Linné, Systema Vegetabilium. C. J. F. Gmelin, Lyon.

Govaerts, R. 1999. *Cineraria tomentolanata* Govaerts, nom. nov. (as "*tomentolanatus*"). World Checklist Seed Plants 3(1): 15.

Harvey, W. H. 1865. Compositae. *In:* W. H. Harvey & O. W. Sonder (editors), Flora Capensis 3. Hodges, Smith, Dublin; L. C. Juta, Capetown.

Hutchinson, J. 1916. A Botanist in Southern Africa. P. R. Gawthorn, London.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Lessing, C. F. 1832. Synopsis Generum Compositarum. Duncheri & Humblotii, Berlin.

Linnaeus, C. 1759. Systema Naturae. Ed. 10. Holmiae, Stockholm, Laurentii Salvii.

Linné, C.von f. 1782. Supplementum Plantarum. Braunschweig.
Miller, P. 1768. The Gardener's Dictionary. Ed. 8. London.
Nordenstam, B. 1976. *Lamprocephalus* B. Nord., a new senecioid genus from South Africa. Bot. Not. 128: 323–326.
———. 1978. Taxonomic studies in the tribe Senecioneae (Compositae). Opera Bot. 44: 1–84.
Scopoli, J. A. 1772. Flora Carniolica. Ed. 2. Vol. 2. I. J. P. Krauss, Vienna.
Thunberg, C. P. 1823. Flora Capensis. J. G. Cottae, Stuttgart.

Bolandia (Asteraceae, Senecioneae): A New Genus Endemic to Southern Africa

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Abstract. The genus *Bolandia* (Asteraceae, Senecioneae) comprises two known species, *B. pedunculosa* and *B. argillacea*, previously included in *Cineraria*. Distinguishing features of *Bolandia* include the fusiform shape of the cypselae and strong median rib on the glabrous inner surface of the ray and outer disc cypselae, solitary ecalyculate capitula on long peduncles, and a truncate style apex with a central tuft of sweeping hairs. *Bolandia* occurs in the mountains of the Western Cape in southern Africa, with a disjunct population of *B. pedunculosa* in the Witteberg of the Eastern Cape and the nearby Drakensberg mountains in Lesotho. *Bolandia argillacea* is endemic to the mountains near Worcester in the Western Cape. Two forms of *B. pedunculosa* are informally recognized, a tomentose and a glabrescent form, the latter including plants previously known as *C. albomontana*.

Key words: Asteraceae, *Bolandia*, *Cineraria*, Compositae, Senecioneae, Western Cape.

The tribe Senecioneae of the Asteraceae is well represented in southern Africa, with about 19 genera (mostly senecioid), eight of which contain three or fewer species (Bremer, 1994). Many of these genera and species are found in the Western Cape and/or montane regions. *Bolandia* Cron is another such genus, comprising two species previously included in *Cineraria* L., namely, *B. pedunculosa* (DC.) Cron and *B. argillacea* (Cron) Cron. Separate and combined molecular (ITS and *trn*L-*trn*F regions) and morphological analyses (Cron, 2005; Cron et al., in prep.) have established this pair of species as a sister-group to the monophyletic and morphologically coherent, revised genus *Cineraria*.

Compression and shape of the mature cypselae are important diagnostic characters of the genus *Cineraria*, along with other features such as the palmate venation of the usually auriculate leaves and radiate, calyculate capitula. Although de Candolle (1837–1838) included the type species for *Bolandia*, *B. pedunculosa*, in *Cineraria* (*C. pedunculosa* DC.), he expressed doubt concerning its placement: "*An genus proprium?*" (1838: 305), noting that its fruits were not truly compressed. Harvey (1865) placed this species in *Cineraria* sect. *Cineraria*, noting that the young cypselae were compressed. However, cypselae of many genera of Senecioneae appear compressed when immature, and other morphological features also serve to unequivocally distinguish *Bolandia* from *Cineraria*.

Bolandia occurs mainly on the mountains of the Western Cape, in the vicinity of Worcester and also in the Ceres, Clanwilliam, Laingsburg, and Swellendam districts (Fig. 1). This part of the Western Cape includes an area often referred to among the local population as the "boland," an Afrikaans term meaning "highlands" and pertaining to a region that includes the original Western Province, namely, the magisterial districts of the Cape, Stellenbosch, Worcester, and Swellendam as they existed at the time of the Cape Colony (Potgieter, 1975). The distribution of *Bolandia* includes mountain ranges in and around this region. A disjunct population of *B. pedunculosa* in the Witteberg of the Eastern Cape and adjacent Lesotho extends the distribution of the genus beyond the Western Cape (Fig. 1).

Bolandia pedunculosa was first described by de Candolle (1837–1838) in his *Prodromus Systematis Naturalis Regni Vegetabilis* and subsequently by Harvey (1865) in *Flora Capensis*. Below is a more detailed description than provided in either reference.

Bolandia Cron, gen. nov. TYPE: *Cineraria pedunculosa* DC., Prodr. 6: 305. 1838. [≡ *Bolandia pedunculosa* (DC.) Cron].

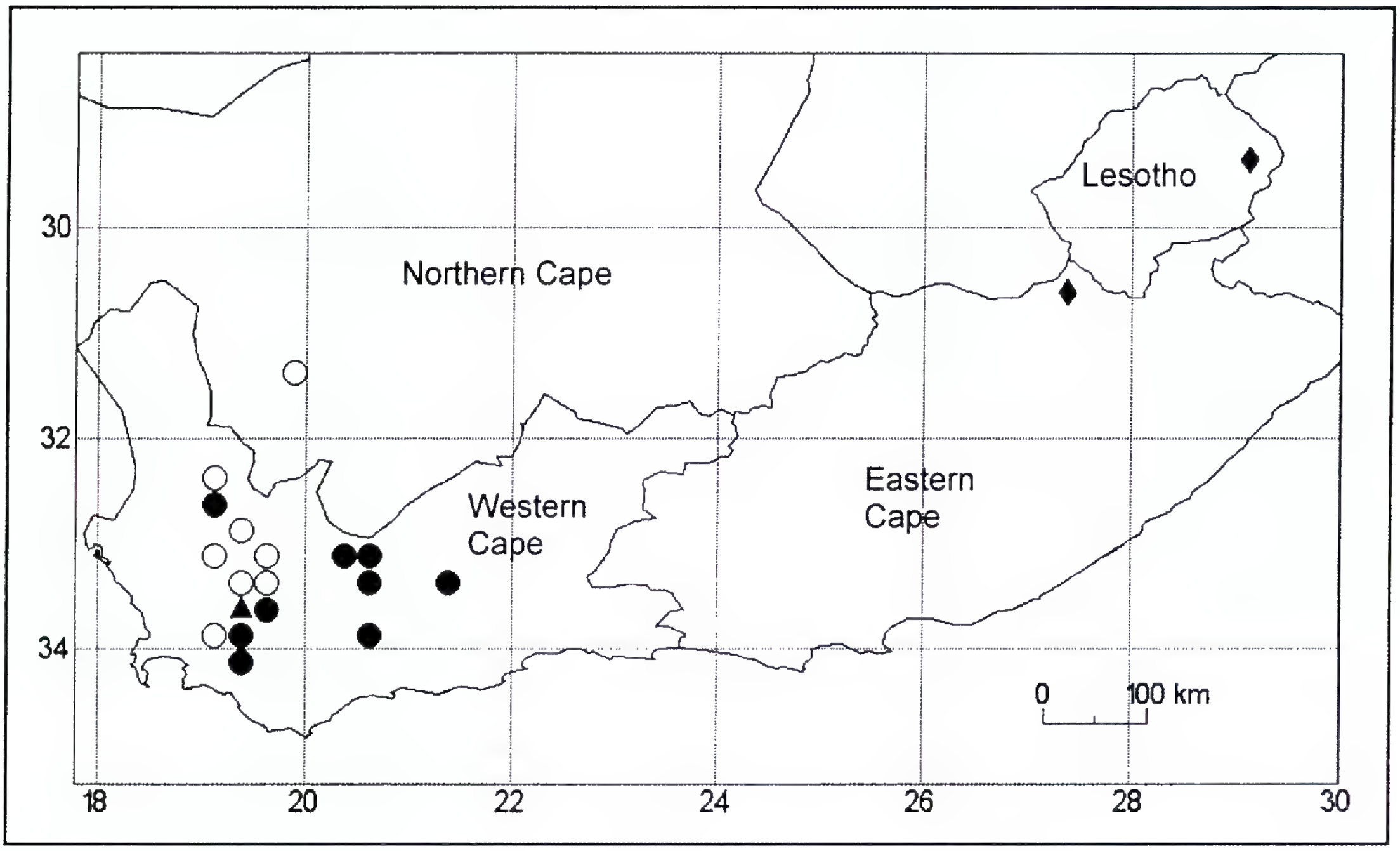

Figure 1. Map of known distribution of *Bolandia*. *Bolandia pedunculosa*: ● tomentose form, ○ glabrescent form, ◆ glabrescent form with predominantly obovate leaves (previously known as *Cineraria albomontana*); ▲ *B. argillacea*.

Cinerariae L. valde affinis, sed involucro ecalyculato et apice ramis stylorum discorum flosculorum truncato atque cypselis non compressis, fusiformibus non obovatis, cypselis exterioribus triangularibus, cypselis discis interioribus quadrangularibus, foliis pinnatinervibus, non palmatis, exauriculatis differt.

Perennial or annual herbs, branching mainly from the base or stoloniferous. *Leaves* alternate, simple, lyrate pinnatifid, pinnatisect, or non-pinnatifid, ovate to elliptic or obovate in outline, cobwebby or tomentose, glabrescent. *Peduncles* long, bracteate, monocephalous; *capitula* heterogamous, radiate, ray florets female, disc florets hermaphrodite; *involucre* ecalyculate, phyllaries uniseriate, with scarious margins, tomentose or cobwebby and glabrescent. *Ray florets* female, with glandular trichomes on tube near base of limb; corolla of disc florets tubular below, upper third campanulate with 5 lobes, with median resin duct, apically papillate; *anthers* with obtuse, triangular to ovate apical appendages, bases minutely sagittate, filament collar gradually widening toward the base (balusterform), endothecial walls radially thickened. *Styles* of disc florets with discrete stigmatic areas, style apices truncate with a central tuft of acute-tipped sweeping hairs and fringing apex, style base shortly campanulate. *Cypselae* narrowly fusiform to elliptic, dimorphic; ray cypselae and outer disc cypselae with prominent inner median rib, triangular in cross section, convex outer surface, inner surfaces of ray cypselae glabrous, outer surfaces covered with short white mucilaginous twin hairs, disc cypselae pubescent all over, quadrangular in cross section; carpopodium distinct, 4 to 6 rows of cells; *pappus* bristles pluriseriate, delicate, scabrid, caducous.

Species 2, South Africa (Western and Eastern Cape), Lesotho.

KEY TO SPECIES OF *BOLANDIA*

1a. Leaves pinnatisect . . . . . *B. argillacea*
1b. Leaves non-pinnatifid and ovate to elliptic to obovate or lyrate pinnatifid . . . . . *B. pedunculosa*

1a. Bolandia argillacea (Cron) Cron, comb. nov. Basionym: *Cineraria argillacea* Cron, S. African J. Bot. 63: 402. 1997. TYPE: South Africa. Western Cape: Worcester District, on slopes at base of Brandwacht Peak, 12 Nov. 1978, *E. Esterhuysen 35117* (holotype, BOL; isotypes, K, S, UPS).

Annual erect herb (or possibly persisting for more than one season), 30–50 cm tall; *stems* woody and sometimes branching near the base, finely tomentose, glabrescent toward the base, then reddish brown in color. *Leaves* pinnatisect, green, elliptic to ovate or oblanceolate in outline, lamina 18–33 × 14–24 mm, lobes 4–11 × 0.8–3.0 mm, cobwebby above and below, glabrescent with age; apex extremely acute;

margins dentate, apex of lobes and teeth tipped reddish purple; base cuneate and decurrent along petiole; petiole 8–35 mm long, occasionally with lateral pinnae along length, cobwebby; exauriculate, sometimes widening slightly at base to clasp stem. *Capitula* heterogamous, radiate, solitary on terminal peduncles; peduncles 130–175 mm long, cobwebby, glabrescent, bracteate (bracts 2–6(−13) mm long); *involucre* ecalyculate, phyllaries 10 to 12, 5.5–6.5 mm long, woolly at the base, glabrescent toward the tips, margins membranous. *Ray florets* 6 to 9, commonly 8, 8.5–10.5 mm long, limb 6–8 mm long, 5-veined. *Disc florets* 18 to 32, corolla ca. 4.5 mm long. *Cypselae* narrowly oblong to fusiform, dimorphic, ray cypselae 3-angled with prominent median rib on inner surface, outer surface of ray cypselae convex, inner surface glabrous, outer surface of ray cypselae covered with short white mucilaginous twin hairs, disc cypselae subcylindrical, pubescent on inner and outer surfaces, black when mature, 4.5–5.2 mm long; *pappus* 3/4 length of mature disc floret, caducous.

Phenology. Flowering in October and November.

Distribution. South Africa, in the Western Cape, apparently endemic to the slopes below Brandwacht Peak in the mountains near Worcester.

Habitat. *Bolandia argillacea* is reportedly restricted to the clay zones on the mountain, growing in association with *Erica leucanthera* L.f., but not extending into the renosterbos (shrubland dominated by *Elytropappus rhinocerotis* (L.f.) Less.). It grows at 1700–1800 m on the southeastern and eastern slopes of the mountain.

Conservation status. Due to its very restricted distribution and occasional occurrence in its particular habitat, *Bolandia argillacea* is considered to be Vulnerable VU D2 (J. Victor, pers. com.), using IUCN (2001) criteria. Its habitat is not likely to be threatened by human activities, but its continued existence may well be threatened by climate change.

Specimens examined. SOUTH AFRICA. **Western Cape**: Worcester District, slopes at base of Brandwacht Peak, along path toward Fonteintjiesberg, *Esterhuysen 36192* (BR, E, K, US); Brandwacht, clay slopes at foot of Chavonnesberg, *Esterhuysen 8195* (BOL).

1b. Bolandia pedunculosa (DC.) Cron, comb. nov. Basionym: *Cineraria pedunculosa* DC., in Prodr. 6: 305. 1838. TYPE: South Africa. Western Cape: Caledon, Potrivier, Langehoogde, Bontjeskraal, bis am Zwarteberg, 165–660 m, July 1835?, *C. F. Ecklon & C. L. P. Zeyher 1519* (holotype, G-DC; isotype, S). Figure 2.

Cineraria albomontana Hilliard, in Notes Roy. Bot. Gard. Edinburgh 45: 185–187. 1989. Syn. nov. TYPE: South Africa. Eastern Cape: Lady Grey, Witteberg, Joubert's Pass, 2465– 2530 m, 18 Jan. 1979, *O. M. Hilliard & B. L. Burtt 12177* (holotype, E; isotypes, K, NU, S).

Perennial herb, up to 30 cm tall, with a vertical woody rootstock; *stems* woody at the base, branching occasionally from the base, white tomentose, nodes very close together. *Leaves* non-pinnatifid, ovate to elliptic to obovate, or lyrate pinnatifid, deeply to shallowly lobed with terminal lobe ovate to elliptic or obovate in outline, usually with 1 or 2 pairs of lateral pinnae, lamina 11–32(−73 in glabrescent form) × 8–27 mm, cobwebby above, usually glabrescent, tomentose or cobwebby and glabrescent below; apex rounded; margin dentate to crenate with apiculate tips; base cuneate and decurrent or truncate to slightly cordate; petiole (14–)23–55 mm (−86 mm in glabrescent form) long, cobwebby to tomentose; auricles absent, petiole widens somewhat at base to clasp stem. *Capitula* heterogamous, radiate, solitary, axillary; peduncles (30–)80–240 mm (−330 mm in glabrescent form) long, cobwebby, glabrescent, conspicuously bracteate, bracts (2–)5–11 mm long; *involucre* ecalyculate, phyllaries 8 to 14(to 15), 5–7 mm (−9 mm in glabrescent form), cobwebby to tomentose, glabrescent, margins scarious. *Ray florets* 8 to 11, 8.0–9.5 mm long, limb 6–8 mm long (5–12 mm in glabrescent form), 4-veined (mostly 5- or 6-veined in glabrescent form). *Disc florets* (25 to)30 to 55, corolla 4.5–5.0 mm long (−6.0 mm in glabrescent form). *Cypselae* fusiform, dimorphic; ray cypselae 3-angled with prominent median rib on inner surface, inner surface glabrous, convex outer surface covered with short mucilaginous white twin hairs, compressed when young, black when mature, ca. 4 mm long; disc cypselae subcylindrical (outer ones with prominent inner median rib), 4-ribbed when mature, black with short white twin hairs all over, 3–4 mm long; *pappus* scabrid, 3/4 length of disc floret corolla, caducous.

Phenology. Flowering mainly from September to November (to January in glabrescent form), rarely as early as August.

Distribution. South Africa, Western Cape: the tomentose form occurs in the Witteberg of the Laingsburg District, in the Keeromsberg near Worcester, and near Barrydale in the Swellendam districts; the glabrescent form occurs on the summit of Milner's Needle in the Hex River Mountains, on Du Toits Peak near Worcester, in the Baviaansberg (Ceres District), and in the Cederberg (Clanwilliam District). The glabrescent form also occurs in the Witteberg near Lady Grey in the Eastern Cape and

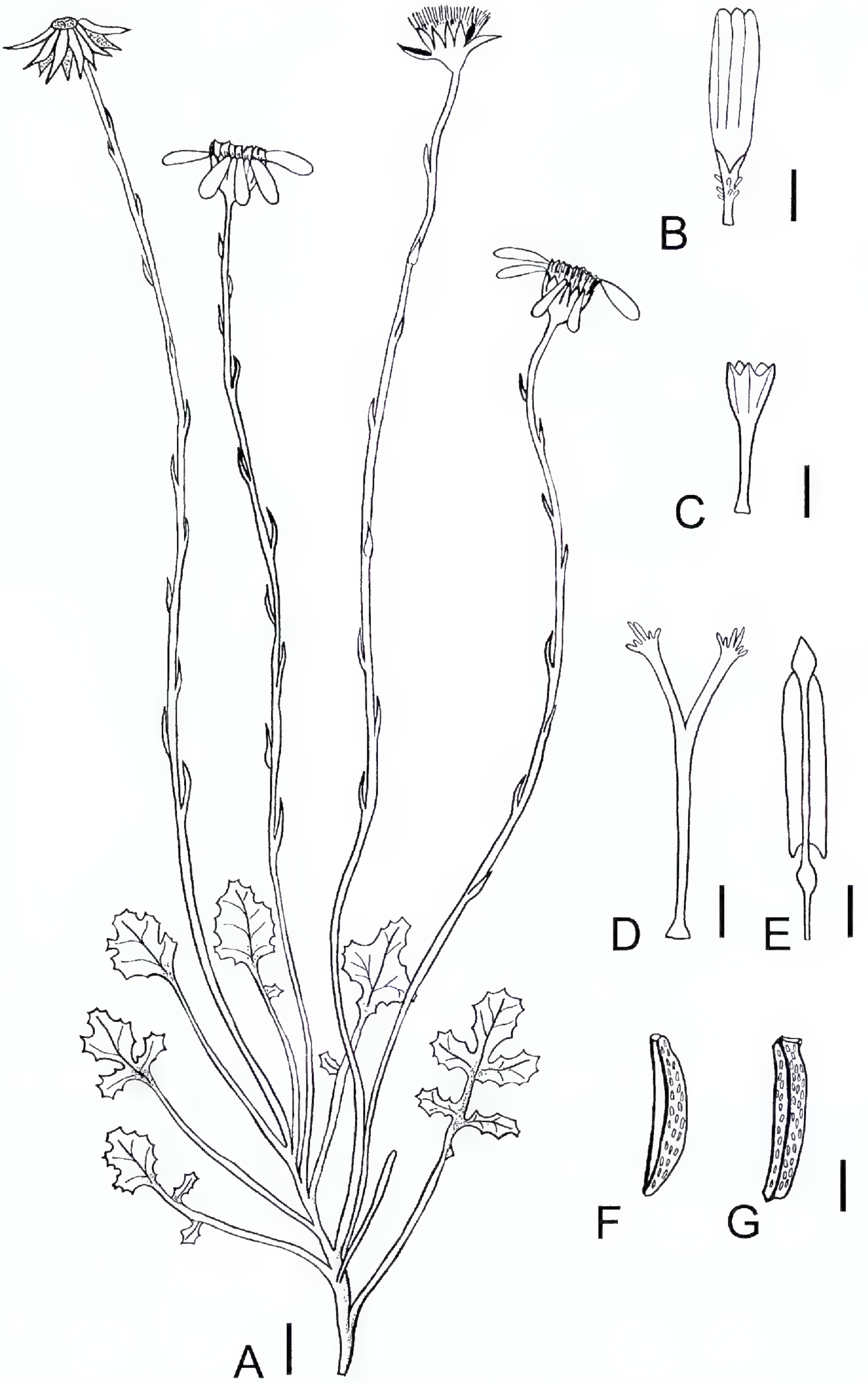

Figure 2. Illustration of *Bolandia pedunculosa*. —A. Habit. Scale bar = 13 mm. —B. Ray floret. Scale bar = 2.0 mm. —C. Disc floret. Scale bar = 2.1 mm. —D. Style. Scale bar = 500 µm. —E. Stamen. Scale bar = 500 µm. —F. Ray cypsela. Scale bar = 1.3 mm. —G. Disc cypsela. Scale bar = 1.3 mm. Drawn from *Compton 2772* (BOL, K).

on Thaba Ntlenyana in Lesotho, these eastern populations being previously treated as *Cineraria albomontana* (Hilliard, 1989).

Habitat. Growing in dense clumps on steep, stony south- or southeast-facing slopes, between grass tussocks, at the base of cliffs, among rocks or on rocky summits, on shale bands, in sand or on basalt, with the tomentose form mainly at an altitude range of 1000–1500 m, and the glabrescent form ranging from 1650–2300 m in the Western Cape and 2450–3350 m in the Eastern Cape and Lesotho.

Conservation status. Localized, not common. Possibly rare, but of Least Concern, applying IUCN (2001) criteria.

Selected specimens examined. **Tomentose form**: SOUTH AFRICA. **Western Cape**: Wuppertal, Duiwelsgat, S Cederberg, Sneeuwberg, *Esterhuysen 13104* (BOL); Worcester, Keeromsberg, *Esterhuysen 26629* (BOL); Villiersdorp, Caledon, *Esterhuysen 4870* (BOL); Tweedside, *Keary 1127* (BOL), *Compton 3110* (BM, BOL), *Compton 3111* (BOL); Bantams Karoo, *Compton 12241* (NBG); Witteberg, S of Bantams, *Esterhuysen 30520* (BOL); Laingsburg District, Witteberg, *Compton 2722* (BOL, K), *Compton 21140* (NBG); Witteberg, Fisantekraal, *Compton 21108* (NBG); Witteberg, Whitehill, *Compton 13922* (NBG), *Compton 16263* (NBG); Swellendam District, near Barrydale, *Barker 5398* (NBG); Ladismith District, Seven Weeks Poort, *Phillips 1468* (SAM); Zwartberg, Caledon, *Zeyher s.n. sub SAM 16975*. **Glabrescent form**: LESOTHO. Thaba Ntlenyana, *Guillarmod 2325* (PRE). SOUTH AFRICA. **Eastern Cape**: Lady Grey, Witteberg, Joubert's Pass, *Hilliard & Burtt 12177* (K, S), *Cron & Goodman 544* (J). **Northern Cape**: Calvinia, Ekerdam, *Taylor 2686* (BOL); Clanwilliam, Cederberg Mts., Peak S of Sneeuwkop, *Esterhuysen 7547* (BOL); Cederberg, Sneeuwkop, *Stokoe s.n. sub SAM 57134*; Cederberg, Sneeuwberg, *Esterhuysen 18045* (BOL); Ceres, Bokkeveld, Tafelberg, *Esterhuysen 3918* (BOL). **Western Cape**: Tulbagh, Great Winterhoek, *Esterhuysen 27004* (BOL); Worcester, Milner's Needle, Hex River Mts., *Esterhuysen 14880* (BOL); Ceres, Baviaansberg, W of Karoopoort, *Esterhuysen 29858* (BOL); Roodeburg, Hex River Mts., *Esterhuysen 20924* (BOL); Worcester, Du Toits Peak, *Esterhuysen 8583* (BOL).

A number of specimens that constitute a much more glabrescent form are considered here to match *Bolandia pedunculosa*. A collection by Esterhuysen [*26629* (BOL)] from the Keeromsberg in the Worcester District of the Western Cape has both glabrescent and tomentose forms present. Increased glabrescence is linked to higher altitude and also slightly larger capitula in *B. pedunculosa*. Included in this glabrescent form of *B. pedunculosa* is *Cineraria albomontana* Hilliard from the Witteberg of the Eastern Cape, South Africa, and Thaba Ntlenyana in Lesotho. Both tomentose and glabrescent forms have a range of leaf shape, varying in degree of lamina dissection from entire to lyrate-pinnatifid with two to four pairs of lateral pinnae below the terminal lobe.

Distinguishing features of *Bolandia* include the shape and surface features of the cypselae, capitula arrangement and style branch apices. The solitary capitula are borne on long peduncles and the involucre is ecalyculate (Fig. 2A). The apex of the branches of the style of the disc florets is truncate with a fringe and a central tuft of sweeping hairs (Figs. 2D, 3C). The cypselae are fusiform to elliptic in shape and are heteromorphic (Fig. 2F, G). Mature ray cypselae have a strong median rib on the inner surface, which is glabrous, the outer surface being convex and covered in short white twin hairs (Fig. 3A, B). The disc cypselae are mostly cylindrical (terete in cross section), although the outermost ones may be markedly curved with a prominent inner median rib as in the ray cypselae, but all disc cypselae are pubescent on inner and outer surfaces. As in *Cineraria* and many of the Senecioneae, the anthers have ovate apical appendages and balusterform collars (Fig. 3D).

In contrast to *Bolandia*, *Cineraria* has obovate, laterally compressed cypselae with distinct margins or wings, a calyculate involucre on capitula that are commonly borne in lax cymes or corymbs of few to many capitula, and an obtuse style apex that has a fringe of sweeping hairs, as well as a central tuft. In addition, the distinctive palmate venation and lobing of the auriculate leaves of *Cineraria* is not seen in leaves of *Bolandia*, which are pinnately-veined, ovate to elliptic to obovate in outline and exauriculate. Furthermore, the epicarp cells of cypselae in *Cineraria* are sub-isodiametric, whereas those of *Bolandia* are more elongate.

Characters shared by *Bolandia* and *Cineraria* include a distinct carpopodium, although it is generally larger in *Cineraria* (8 to 14 rows of cells) than *Bolandia* (4 to 6 rows of cells), glandular trichomes on the ray florets, and the central tuft of sweeping hairs on the disc styles (present in most species of *Cineraria*). Leaf trichomes in *Bolandia* have two to four narrow basal cells and a multi-celled long apical appendage, attached obliquely to the basal cells. This type of trichome is common in the Senecioneae and is also present in some species of *Cineraria* (e.g., *C. albicans* N. E. Brown).

Mesogramma apiifolium DC., a recently reinstated monotypic genus (Nordenstam & Pelser, 2005) that includes *Cineraria microglossa* DC. (Nordenstam & Cron, in prep.), has cypselae morphologically similar to *Bolandia*. Other characters in common between *Mesogramma* and *Bolandia* are their herbaceous habit and the resin ducts in the involucral bracts. *Mesogramma* DC. differs from *Bolandia* in its lack of tomentum, the calyculate involucre, and glabrous ray floret tubes (Nordenstam & Pelser, 2005; pers. obs.).

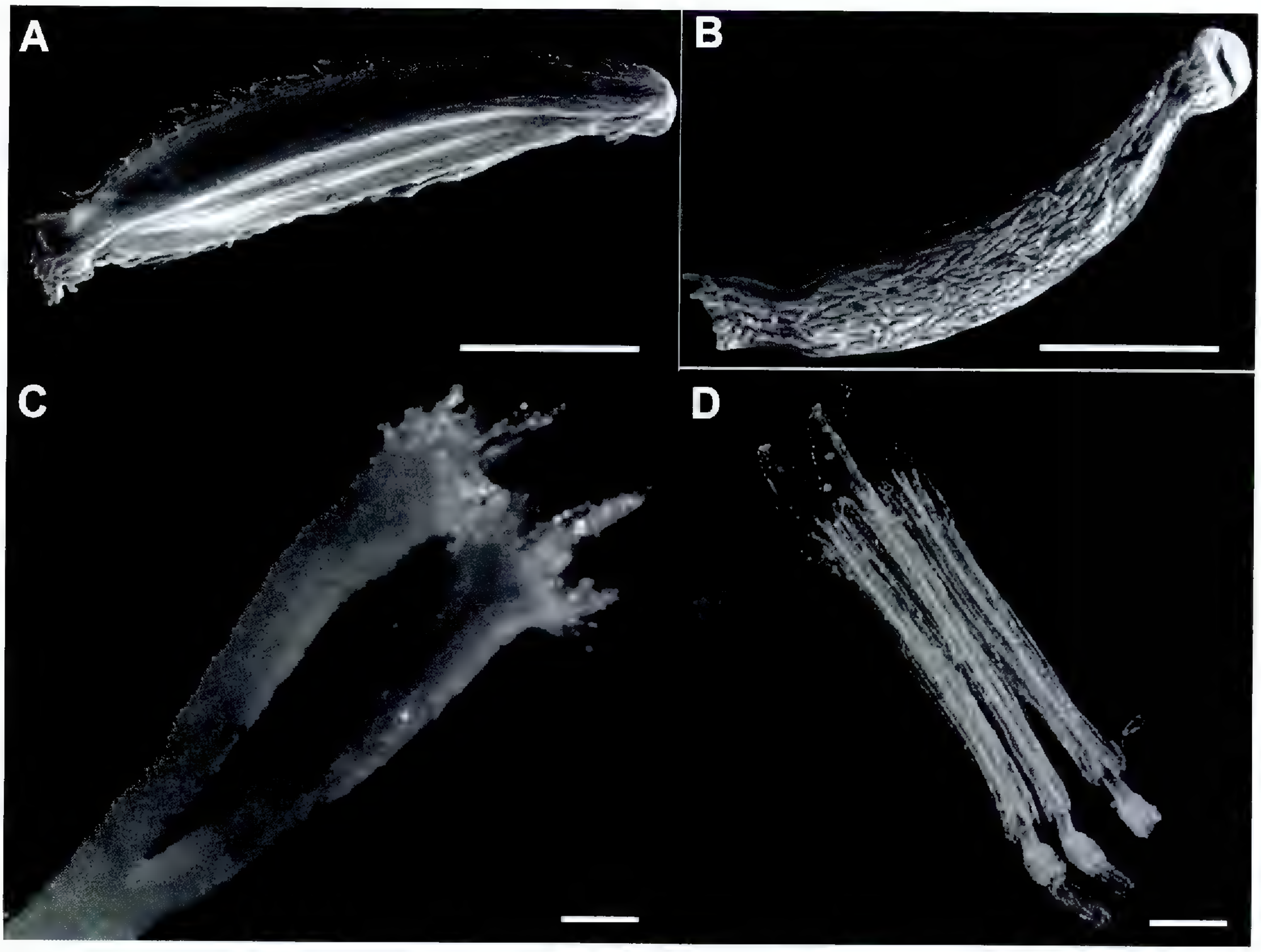

Figure 3. *Bolandia pedunculosa*. —A, B. Scanning electron micrographs of ray cypsela with glabrous inner surface and pubescent outer surface. Scale bars = 1 mm. —C. Truncate style apices with central tuft and fringe of sweeping hairs. Scale bar = 215 µm. —D. Stamens with ovate apical appendages and balusterform filament collars. Scale bar = 300 µm.

Stilpnogyne DC. is an ecalyculate monotypic genus from the Northern and Western Cape that also has cypselae of the same shape, color, and indumentum as *Bolandia* (i.e., black with all surfaces covered in short white hairs), but they are not heteromorphic. In addition, it differs from *Bolandia* by its palmately veined leaves and very small disciform capitula, with only 7 or 8 florets (vs. a minimum of 24 florets in *Bolandia*).

Endemism and conservation. The distribution and altitudinal range of *Bolandia* places it in the Cape Floristic Region, the boundaries of which are difficult to define because it extends into neighboring and other phytochoria and contains enclaves of other floristic regions (Van Wyk & Smith, 2001). Its core area is best defined in geological terms as the outcrops of the Table Mountain and Witteberg Groups of the Cape Supergroup (Van Wyk & Smith, 2001). The average altitude of the mountains is 1000–1500 m, with individual peaks over 2000 m. *Bolandia* tends to be associated with mountain fynbos (as opposed to renosterbos) and occurs mainly in fire-free sites at the base of cliffs, overhangs, and among rocks. The Cape Floristic Region is noted for its high levels of endemism (about 70%), including 210 endemic or near-endemic genera (Goldblatt & Manning, 2000; Van Wyk & Smith, 2001). *Bolandia* is yet another near-endemic genus, with a connection to the Drakensberg Afro-alpine centre, and *Bolandia argillacea* is endemic to the mountains near Worcester.

Up to 90% of the mountain fynbos in the Cape Floristic Region is protected in nature reserves and mountain catchment areas or by the inaccessibility of the terrain (Rebelo, 1994). This is in contrast to the lowlands of the Overberg and Worcester-Robertson Karoo Centre (i.e., below 600 m), where agriculture is a major activity and conservation of remaining natural vegetation is an issue requiring attention (Hilton-Taylor & Le Roux, 1989; Wood, 1991; Van Wyk & Smith, 2001). As noted previously, *Bolandia* occurs at high altitudes (at 1000 m and above), so its continued existence should not be under direct threat from man, although it should be noted that it is never abundant and climate change may have an adverse effect on all such montane vegetation.

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Literature Cited

Bremer, K. 1994. Asteraceae: Cladistics and Classification. Timber Press, Portland, Oregon.

Candolle, A. P. de. 1837–1838. Prodromus Systematis Naturalis Regni Vegetabilis VI. Treutel & Würtz, Paris.

Cron, G. V. 2005. *Cineraria* L. (Senecioneae, Asteraceae)—Its Taxonomy, Phylogeny, Phytogeography and Conservation. Unpublished Ph.D. Thesis. University of the Witwatersrand, Johannesburg.

Goldblatt, P. & J. Manning. 2000. Cape Plants: A Conspectus of the Cape Flora of South Africa. Strelitzia 9. National Botanical Institute of South Africa, Pretoria, and Missouri Botanical Garden Press, St. Louis.

Harvey, W. H. 1865. *Cineraria*. Pp. 307–314 *in* W. H. Harvey & O. W. Sonder (editors), Flora Capensis, Vol. 3. Hodges, Smith, Dublin; L. C. Juta, Cape Town.

Hilliard, O. M. 1989. Notes on some plants from southern Africa: XV. Notes Roy. Bot. Gard. Edinburgh 45: 185–187.

Hilton-Taylor, C. & A. Le Roux. 1989. Conservation status of the fynbos and karoo biomes. Pp. 202–223 *in* B. J. Huntley (editor), Biotic Diversity in Southern Africa: Concepts and Conservation. Oxford Univ. Press, Cape Town.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Nordenstam, B. & P. Pelser. 2005. *Dauresia* and *Mesogramma*: One new and one resurrected genus of the Asteraceae Senecioneae from Southern Africa. Compositae Newslett. 42: 74–88.

Potgieter, D. J. (editor). 1975. Encyclopaedia of Southern Africa. Volume 11: 406. Nasau, Cape Town.

Rebelo, T. 1994. Cape Floristic Region. Pp. 218–224 *in* S. D. Davis, V. H. Heywood & A. C. Hamilton (editors), Centres of Plant Diversity. A Guide and Strategy for Their Conservation, Vol. 1. IUCN Publications Unit, Cambridge.

Van Wyk, A. E. & G. F. Smith. 2001. Regions of Floristic Endemism in Southern Africa. Umdaus Press, Pretoria, South Africa.

Wood, J. 1991. Threats facing the Robertson Karoo. Veld Fl. 77: 16–17.

A New Heterophyllous *Spermacoce* Species (Rubiaceae) from the Marungu Highlands, Democratic Republic of the Congo

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ABSTRACT. *Spermacoce heteromorpha* Dessein (Rubiaceae, Spermacoceae) is newly described and illustrated. It grows on the Marungu highlands of the Democratic Republic of the Congo (D.R. Congo) at altitudes of 1800 to 1900 m. The species resembles the Tanzanian *Spermacoce taylorii* Verdcourt, from which it mainly differs in having terminal inflorescences, only slightly exserted anthers, and densely pubescent stems. Moreover, *Spermacoce heteromorpha* features marked heterophylly, with long leaves at the plant's base and much shorter cauline leaves, a type of heterophylly rarely observed in *Spermacoce* or in the Rubiaceae as a whole. The finding of this species exemplifies the unique floristic richness of this under-explored part of D.R. Congo.

Key words: Democratic Republic of the Congo, heterophylly, Marungu highlands, Rubiaceae, *Spermacoce*.

Spermacoce L. is a pantropical genus of the family Rubiaceae comprising an estimated 275 species (Dessein et al., 2002; Harwood & Dessein, 2005). Tropical America, tropical Africa, and the northern part of Australia are the main centers of diversity. The genus is characterized by its herbaceous growth form, the fimbriate stipules connected to the petioles, the 4-merous flowers arranged in compact lateral and/or terminal inflorescences, the bilocular ovaries with a single ovule per locule, the often pluriaperturate pollen grains, and the dry dehiscent fruits. Many botanists know *Spermacoce* as a genus of annual weeds of ruderal places. Typical examples are *S. latifolia* Aublet and *S. verticillata* L., two species presumably native to America, but introduced in Africa, Asia, and Australia. Narrow endemics, however, are an element of the genus with a comparable level of importance. Our study of *Spermacoce* from the high plateaus of the Zambezian regional center of endemism, for example, revealed the existence of endemic or disjunct *Spermacoce* species on the Angolan, Zambian, and Katangan high plateaus (Dessein et al., 2002, 2003). Within the Lisowski, Malaisse, and Symoens collection of POZG, which was recently put at our disposal, unicate *Spermacoce* specimens from the Marungu highlands (D.R. Congo) were found representing another narrow endemic as described below.

HETEROPHYLLY

Heterophylly is not uncommon among woody Rubiaceae (Robbrecht, 1988), but is rarely observed among the herbaceous representatives of the family. Within *Spermacoce*, it has only been recorded for *S. hockii* (De Wildeman) Dessein, a perennial from D.R. Congo (Dessein et al., 2003). In this species, long linear leaves develop from the woody plant base, while the cauline leaves are broader and much shorter. During field work in Zambia, we observed that several biannual or short-lived perennial *Spermacoce* species develop rosettes of basal leaves. This feature was observed in the field for *S. dibrachiata* Oliver, *S. perennis* Verdcourt, and *S. phyteumoides* Verdcourt. Herbarium collections rarely show the basal leaves, as the basal part is seldom collected. In the three above-mentioned species, basal rosette leaves differ only slightly in size and shape from the cauline leaves. In *S. heteromorpha*, on the contrary, the basal leaves are markedly longer than the cauline ones. The type specimens of *S. taylorii* Verdcourt also have basal and cauline leaves, but the differences between the two leaf types are minor.

THE MARUNGU HIGH PLATEAU

The Marungu high plateau is situated southwest of Lake Tanganyika in D.R. Congo. The name of the plateau is derived from the word "dilungu," which signifies "herbaceous plateau" (Verbeken, 1954). The name refers to a main feature of the environment, the absence of tree growth in the more elevated areas.

Very little detail is known, however, about the vegetation and environmental conditions of the region. Floristically, too, the area remains underexplored. Duvigneaud (1952) included the plateau in the "district des plateaux Katangais," which also comprised the Biano, Kibara, and Kundelungu plateaus. Later, he placed the Marungu plateau in a district of its own because the vegetation shows several East African elements not found on the other Katangan plateaus (Duvigneaud, 1958). Most subsequent authors followed his opinion.

The Marungu region reaches altitudes up to 2460 m (mont Lusale) and is mainly covered by savannahs (Lisowski et al., 1971). The vegetation of the savannahs is composed of many species of Cyperaceae and Poaceae, along with geoxylic herbs. During the dry season, other plants, such as *Helichrysum* Miller species (Asteraceae), may develop (Duvigneaud, 1958; Lisowski et al., 1971). White (1976) pointed out that the main factor accounting for the absence of trees is the waterlogged soils of the plateaus, rather than the presence of sporadic frost periods or temporal burning. The Marungu plateau is isolated from the other highland areas and thus forms an island of very peculiar environmental and edaphic conditions. As a consequence, the Marungu plateau might house a large number of endemic taxa, as observed on the other Katangan plateaus (Lisowski et al., 1971; Malaisse et al., 1995; Geerinck et al., 1996; Dessein et al., 2003).

Taxonomy

Spermacoce heteromorpha Dessein, sp. nov. TYPE: D.R. Congo. Katanga: plateau des Marungu, Kibobwa, 15 Feb. 1970, *S. Lisowski, F. Malaisse & J.-J. Symoens 9696* (holotype, POZG; photos, BR, K, LV, MO, P). Figure 1.

Similis *Spermacocae taylorii* a qua inflorescentiis terminalibus et compactis, antheris vix exsertis et caulibus pubescentibus differt. Praeterea bene distincta habitu heterophyllo manifesto, cum foliis basalibus duplo longioribus quam illis caulinis.

Robust, erect herb with few stems from a woody perennial base with woody taproot; stems 45–55 cm tall, strictly erect, with short branches in the upper part bearing the inflorescences, densely covered with short, stiff, often ascending trichomes. Plants heterophyllous, with long leaves at the base and shorter cauline leaves. Leaves decussate, sessile, fused with the stipule base; blades of basal leaves narrowly elliptic to linear, (3–)11–22 × 0.7–2.2 cm; cauline leaves narrowly elliptic, (2–)5–10 × 0.8–1.7 cm, young leaves often densely covered with short stiff trichomes above and underneath, older leaves glabrescent; apex acute; base gradually narrowed; leaf margins somewhat thickened, beset with short stiff trichomes or scabrous; midvein somewhat prominent, densely pubescent toward the base underneath, sparsely pubescent above, with indistinct secondary and tertiary veins. Stipules fimbriate; stipule base 4–18 mm long, beset with short appressed trichomes, often with stalked colleters in between the fimbriae; fimbriae 3 to 6, up to 6(−12) mm long, ciliate. Flowers sessile in many-flowered capitula; inflorescences terminal, composed of several condensed flowering nodes each with a pair of subtending leaves, up to 3.5 cm wide in flowering stage; bracts stipuliform with numerous setae 3–6 mm long. Calyx tube ca. 0.5 mm high; lobes 2 or 3 (rarely no distinct lobes visible), narrowly triangular or leaf-like, often unequal, 2–8 mm long, beset with long hyaline trichomes, sometimes with numerous setae in between the lobes. Corolla blue; tube funnel-shaped, 6–8.5 mm long, glabrous or sparsely pubescent outside, with a trichome ring around or below its middle inside; lobes triangular, 4–6 mm long, 2–2.5 mm wide at the base, pubescent outside, glabrous inside; anthers narrowly elliptic in outline, 1.5–2 mm long, exserted; filaments 1–2 mm long. Pollen 14–17-zonocolporate, oblate to suboblate; equatorial diameter 67–83 µm; polar outline circular and somewhat lobed; ectocolpi relatively long; endoaperture a broad endocingulum; tectum perforate to microreticulate; microspines uniformly present; inner nexine surface granular with endocracks. Ovary ellipsoid to narrowly ellipsoid, 3–4.5 mm long, pubescent in the upper part; style 9–12 mm long, exserted; stigma shortly 2-lobed, ca. 1 mm wide; nectary disc bipartite. Capsule and mature seeds unknown; young seeds show the initiation of a basal elaiosome.

Distribution, habitat, and phenology. Endemic to the northern part of the Zambezian regional centre of endemism; only known from two collections from the Marungu high plateau (Katanga province, D.R. Congo) in grassland at 1800–1900 m elevation. Flowering specimens were collected in February.

Affinities with other species. *Spermacoce heteromorpha* is most similar to *S. taylorii*, a narrow endemic from the Songea district in Tanzania. The habit resemblance is especially striking: a woody base from which a few erect stems arise. Furthermore, *S. taylorii* shows a tendency toward the same type of heterophylly, much weaker, however, than in *S. heteromorpha*. Inflorescence and floral morphology clearly separate the two species. Whereas the flowers of *S. heteromorpha* are arranged in many-flowered terminal capitula, those of *S. taylorii* are in clusters at the

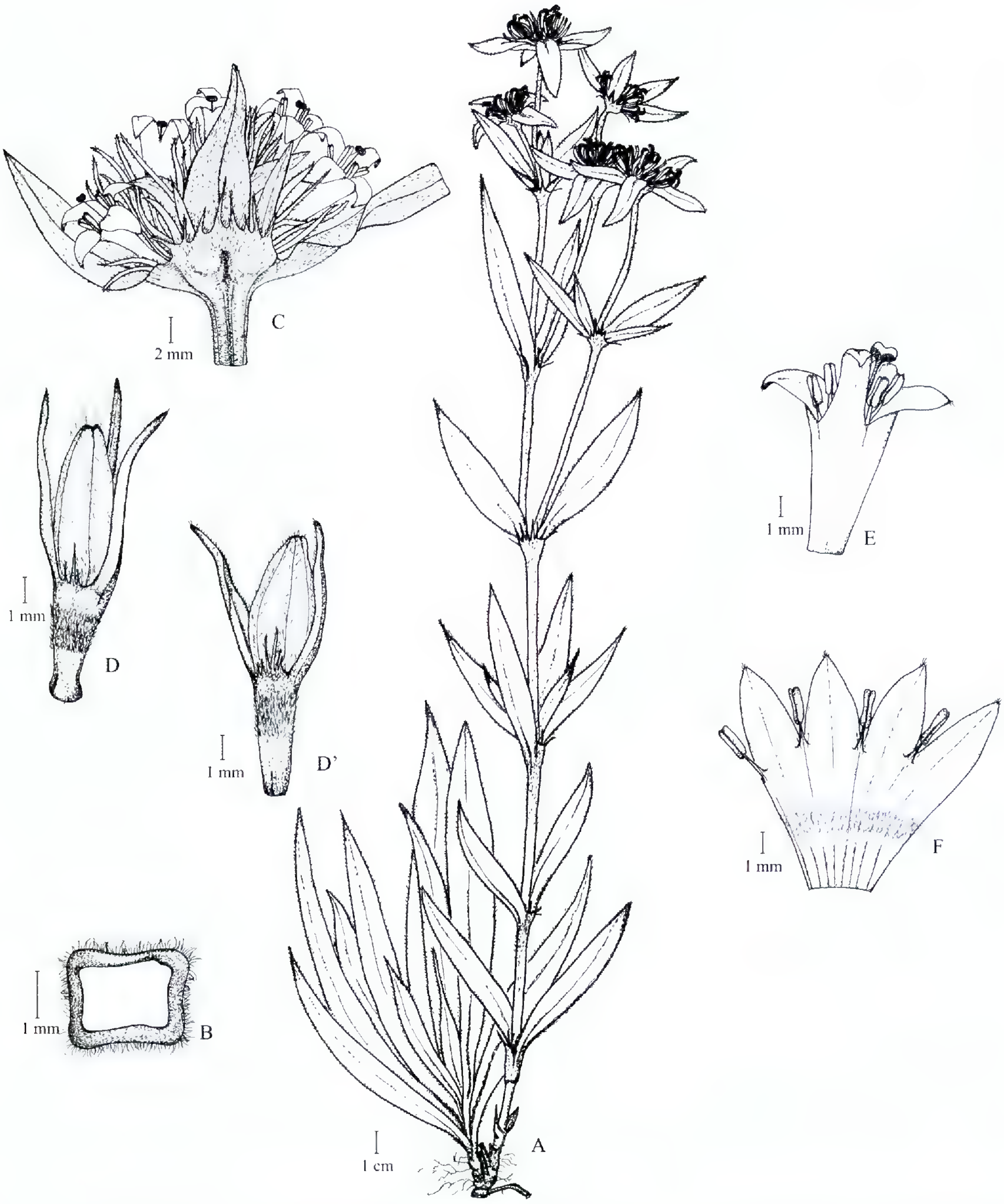

Figure 1. *Spermacoce heteromorpha* Dessein. —A. Habit. —B. Detail of stem. —C. Inflorescence. —D, D'. Flower buds showing variability of calyx. —E. Corolla, stamens, and style. —F. Open corolla showing stamens and a ring of trichomes. A. *Lisowski, Malaisse & Symoens 9696* (POZG); B–F. *Lisowski, Malaisse & Symoens 10061* (POZG).

nodes along the stem, from which the upper 4 or 5 run together to form a more congested cone-like inflorescence. The corolla tubes are similar, but the corolla lobes are, based on Verdcourt's (1976) measurements, much longer in *S. taylorii* (10–11 mm vs. 4–6 mm). The anthers of *S. heteromorpha* are only exserted for 1–2 mm, while those of *S. taylorii* are exserted for more than 5 mm. Further evidence for the separation of the two species is found in the characteristics of the external indumentum: *Spermacoce taylorii* is almost entirely glabrous, whereas *S. heteromorpha* is densely covered with trichomes on almost all organs. *Spermacoce perennis*, collected from the northeastern part of Zambia, also has a similar habit. *Spermacoce perennis* lacks, however, some very characteristic features of *S. heteromorpha*: heterophylly is usually absent or, if present, the basal leaves are shorter than the cauline

ones; the inflorescences are both terminal and axillary; the cauline leaves are much narrower; and secondary nerves are invisible.

Paratype. D.R. CONGO. **Katanga:** plateau des Marungu, au pied du mont Kibobwa, au-dessus du village Kibobwa, steppe au bord d'une petite rivière, 29 42′E 7 31′S, 1900 m, 19 Feb. 1970, *S. Lisowski, F. Malaisse & J.-J. Symoens 10061* (POZG; photos, BR, K, LV, P).

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Literature Cited

Dessein, S., S. Jansen, E. Robbrecht & E. Smets. 2002. A new species of *Spermacoce* (Rubiaceae) from the Manika high plateau (Katanga; R.D. Congo). Nordic J. Bot. 22: 513–523.

———, S. Ntore, E. Robbrecht & E. Smets. 2003. Pollen and seeds reveal that *Spermacoce thymoidea* s.l. (African Rubiaceae, Spermacoceae) represents three endemic or disjunct species from the Zambezian high plateaus. Syst. Bot. 28: 130–144.

Duvigneaud, P. 1952. La flore et la végétation du Congo méridional. Lejeunia 16: 95–124.

———. 1958. Etudes sur la végétation du Katanga et de ses sols métallifères. Bull. Soc. Roy. Bot. Belgique 90: 127–286.

Geerinck, D., F. Malaisse & M. Schaijes. 1996. Orchidaceae du district phytogéographique du Haut-Katanga (Zaïre): Biodiversité et endémisme. Pp. 795–801 *in* L. J. G. van der Maesen, X. M. van der Burgt & J. M. van Medenbach de Rooy (editors), The Biodiversity of African Plants: Proceedings of the XIVth AETFAT Congress. Kluwer Academic Publishers, Dordrecht.

Harwood, R. & S. Dessein. 2005. Australian *Spermacoce* (Rubiaceae: Spermacoceae). I. Northern Territory. Austral. Syst. Bot. 18: 297–365.

Lisowski, S., F. Malaisse & J. J. Symoens. 1971. Une flore des hauts plateaux du Katanga. Mitt. Bot. Staatssamml. München 10: 51–56.

Malaisse, F., J. M. Lecron & M. Schaijes. 1995. Remarques à propos du genre *Monadenium* Pax (Euphorbiaceae), en particulier concernant les espèces de la région zambézienne. Bull. Séances Acad. Roy. Sci. Outre Mer. 40: 389–418.

Robbrecht, E. 1988. Tropical woody Rubiaceae. Opera Bot. Belg. 1. National Botanic Garden of Belgium, Meise.

Verbeken, A. 1954. Contribution à la géographie historique du Katanga et de régions voisines. Koninklijk Belgisch Koloniaal Instituut, Brussel.

Verdcourt, B. 1976. Rubiaceae (part 1): *Spermacoce*. Pp. 339–374 *in* R. M. Polhill (editor), Flora of Tropical East Africa. Crown Agents for Oversea Governments and Administrations, London.

White, F. 1976. The underground forests of Africa: A preliminary review. Gard. Bull. Singapore. XXIX: 57–71.

Oxypetalum gyrophyllum and *O. oblanceolatum*, New Species of Asclepiadoideae (Apocynaceae) from Brazil, and a Key for the *O. insigne* Group

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Abstract. *Oxypetalum gyrophyllum* Farinaccio & Mello-Silva and *O. oblanceolatum* Farinaccio & Mello-Silva, two new species of Asclepiadoideae (Apocynaceae) from Brazil, are described and illustrated. Both species may be included in the *O. insigne* (Decaisne) Malme group. *Oxypetalum gyrophyllum* is closely related to *O. glabrum* (Decaisne) Malme, differing mainly by bigger and more circular leaves, a smaller corpusculum, and smaller teeth, which are curved inward and included versus curved outward and free. *Oxypetalum oblanceolatum* is immediately distinguished from all species of this group by oblanceolate leaves, an uncommon character state in the genus. A key for the species of the *Oxypetalum insigne* group is provided.

Resumo. *Oxypetalum gyrophyllum* Farinaccio & Mello-Silva e *O. oblanceolatum* Farinaccio & Mello-Silva, duas novas espécies de Asclepiadoideae (Apocynaceae), do Brasil são descritas e ilustradas. Ambas podem ser incluídas no grupo de *Oxypetalum insigne* (Decaisne) Malme. *Oxypetalum gyrophyllum* é semelhante a *O. glabrum* (Decaisne) Malme, mas difere pelas folhas maiores e circulares, pelo retináculo menor, e pelos dentes menores, inclusos e incurvados. *Oxypetalum oblanceolatum* é distinto das demais espécies do grupo pelas folhas oblanceoladas, um estado de caráter pouco comum no gênero. Uma chave para as espécies do grupo de *Oxypetalum insigne* é também apresentada.

Key words: Apocynaceae, Asclepiadoideae, Brazil, *Oxypetalum*, *Oxypetalum insigne* group, taxonomy.

Oxypetalum R. Brown (Asclepiadoideae, Apocynaceae) is a Neotropical genus comprising ca. 100 (Cáceres Moral, 1993) to 150 (Hoehne, 1916) species, or possibly up to 180 (Rapini et al., 2001) species. We recognize about 130 species, as did Rapini et al. (2003), distributed mainly in Brazil and Argentina (Cáceres Moral, 1993). Brazil is the center of diversity of the genus (Morillo, 1997), with most of the species being found in the southeast and south. These species occur mainly in savannahs, grasslands, and forest edges (Occhioni, 1956; Fontella-Pereira et al., 1984, 1985, 1989, 1995; Fontella-Pereira & Valente, 1993; Goyder, 1995; Rapini et al., 2001; Farinaccio & Mello-Silva, 2004). *Oxypetalum* is recognized by a combination of certain character states not always present in all species. These include the showy flowers, the rostrated, stigma-like gynostegium, and the horizontal caudicles of the pollinaria, usually with lateral teeth.

Several authors have recognized the *Oxypetalum insigne* (Decaisne) Malme group as an assemblage of species that are more or less well-delimited morphologically (e.g., Decaisne (1838) as *Calostigma*; Malme, 1927; Occhione, 1952; Fontella-Pereira et al., 1984; Rapini et al., 2001; Farinaccio, 2002; Farinaccio & Mello-Silva, 2004). This group includes twining species occurring only in Brazil with a laminar corpusculum longer than the pollinia. *Oxypetalum gyrophyllum* and *O. oblanceolatum* can be included in the *O. insigne* group. Other members of this group are *O. glabrum* (Decaisne) Malme and the recently described *Oxypetalum leonii* Fontella (Fontella-Pereira, 1996), *Oxypetalum rusticum* Rapini (Rapini, 2002), and *O. helios* Farinaccio (Farinaccio, 2002).

Key for the Species of the *Oxypetalum Insigne* Group in Brazil

1a. Stems velutinous-villous or woolly; leaves with dense indument on both sides.
  2a. Stems velutinous-villous; cymes corymbiform; corpusculum up to 2.1 mm long . . . . . *O. insigne*
  2b. Stems woolly; cymes racemiform; corpusculum more than 2.4 mm long . . . . . *O. rusticum*
1b. Stems pubescent to glabrous; leaves nearly glabrous to glabrous adaxially.
  3a. Leaves oblanceolate, abaxial surface tomentose . . . . . *O. oblanceolatum*
  3b. Leaves lanceolate to ovate-lanceolate, ovate, elliptic, or oblong, abaxial surface glabrate.
    4a. Style-head apex bifid with stems filiform.
      5a. Apex of leaves acuminate; peduncle 7–13 mm; pedicels 8–12 mm; seg-

ment of the corona entire with a central tooth-like appendage . . . . . *O. leonii*

5b. Apex of leaves acute to obtuse, mucronate to apiculate; peduncle 1.6–2.2 mm; pedicels 10–18 mm; segment of the corona 3-lobed, lacking an adaxial appendage . . . . . *O. helios*

4b. Style-head apex cup-shaped or bifid with broad and flat stems or filiform stems.

6a. Corolla lobes spatulate or perfectly oblong, apex rounded; corona lobes widely obovate, apex rounded; style-head apex bifid with filiform stems; pollinia 0.17–0.27 mm long . . . . . *O. glaziovianum* Loesener

6b. Corolla lobes lanceolate or linear-oblong, apex acute; corona lobes oblong, apex truncate; style-head apex cup-shaped or bifid with broad and flat stems; pollinia ca. 0.1 mm long.

7a. Leaves 6–7.5 × 3.5–4 cm, elliptic to widely elliptic, chartaceous; adaxial surface of corolla lobes sericeous; corpusculum ca. 0.75 mm long, teeth of caudicle ca. 0.12 mm long, curved inward and included . . . . . *O. gyrophyllum*

7b. Leaves 2.5–7 × 1–2 cm, ovate, oblong, or elliptic, coriaceous; adaxial surface of corolla lobes glabrous; corpusculum 1.2–1.7 mm long, teeth of caudicle 0.25–1 mm long, curved outward and free . . . . . *O. glabrum*

Oxypetalum gyrophyllum Farinaccio & Mello-Silva, sp. nov. TYPE: Brazil. Rio de Janeiro/São Paulo: Parati/Ubatuba, divisa dos estados, trilha para o Pico do Cuscuzeiro, 15 Dec. 2001 (fl), *V. A. O. Dittrich, A. Salino, P. O. Morais & A. C. Meinberg 904* (holotype, SPF; isotype, MO). Figure 1A–D.

Habitu volubili atque corpusculo laminari pollinio longiore ad gregem *O. insignem* pertinet; affinis est *O. glabro* a qua foliis majoribus circularibusque, retinaculis minoribus atque dentibus caudicularum minoribus inclusis incurvatisque differt.

Vines, stems puberulent to glabrate. Leaves opposite, patent; petiole 6–10 mm long, smooth, puberulent; blades 6–7.5 × 3.5–4 cm, elliptic to widely elliptic, discolored, glabrate, chartaceous, with brochidodromous venation, apex mucronate to cuspidate, base rounded, 2 to 3 colleters at base of adaxial blade. Partial inflorescence extra-axillary, alternate, racemiform, 3- to 5-flowered, erect; peduncle 0.6–1 cm long, puberulent; pedicels 1–1.7 cm long, puberulent. Calyx divided almost to base, lobes 4 × 0.15 mm, linear, apex acute, pubescent, 2 to 3 colleters below sinus; corolla greenish cream, lilac in the proximal region, rotate, tube 1.8 mm long, glabrate, lobes 8.5 × 2 mm, lanceolate, patent, twisted, abaxial surface glabrate to minutely puberulent, adaxial surface sericeous, margins hyaline, apex acute, asymmetrical; corona cream, lobes 2 × 1.2 mm, oblong, adaxial surface with carunculate excrescences and a central tooth-like appendage, apex truncate, involute; gynostegium purple, 0.13 mm long, sessile; style-head white, 3 mm long, terete, bifid from the middle, divergent; anthers 0.4–0.53 × 0.6–0.66 mm, slightly quadrangular, terminal appendage 0.82–1.3 × 0.4–0.6 mm, oblong, apex acute, dentate, wings longer than the dorsum; corpusculum 0.75 × 0.15 mm, oblong, laminar, apex truncate to rounded, caudicles 0.12 mm long, flattened, broad, translucent, with horny teeth 0.12 mm long, curved inward and included, pollinia 0.4 × 0.12 mm, oblong. Fruits and seeds unknown.

Oxypetalum gyrophyllum is closely related to *O. glabrum*. Both species are distinguished within the *O. insigne* group by being glabrous or nearly glabrous. In comparison to *O. glabrum*, the new species has larger, more circular leaves (6–7.5 × 3.5–4 vs. 2.5–7 × 1–2 cm), with a rounded base (vs. cordate to truncate, often cordate in *O. glabrum* and in the majority of the species of *Oxypetalum*), hence the specific epithet. *Oxypetalum gyrophyllum* is mainly distinguished by its smaller corpusculum (0.75 vs. 1.2–1.7 mm long) and its teeth (0.12 vs. 0.25–1 mm long), which are curved inward and included (vs. curved outward and free). *Oxypetalum gyrophyllum* is further distinguished by the sericeous adaxial surface of the corolla lobes, which are glabrate in *O. glabrum*.

Distribution, habitat, and phenology. *Oxypetalum gyrophyllum* occurs in the Atlantic rainforest, at an elevation of 900 meters above sea level. It was collected in flower in December.

Oxypetalum oblanceolatum Farinaccio & Mello-Silva, sp. nov. TYPE: Brazil. Paraná: Cândido de Abreu, Três Bicos, 9 July 1970 (fl), *G. Hatschbach 24431* (holotype, SPF; isotype, MBM). Figure 1E–H.

Indumento atque apice gynostegii filiformi affinis est *O. helios* et *O. leonii*, sed ab omnibus speciebus gregi *O. insigni* foliis oblanceolatis optime distincta.

Vines, stems pubescent. Leaves opposite, patent; petiole 0.4–0.7 cm long, smooth, tomentose; blades 3–5 × 0.6–1.1 cm, oblanceolate, discolored, adaxial surface puberulous to pubescent, abaxial surface tomentose, chartaceous, with brochidodromous venation, apex rounded, cirrose, base truncate with 3 to 4

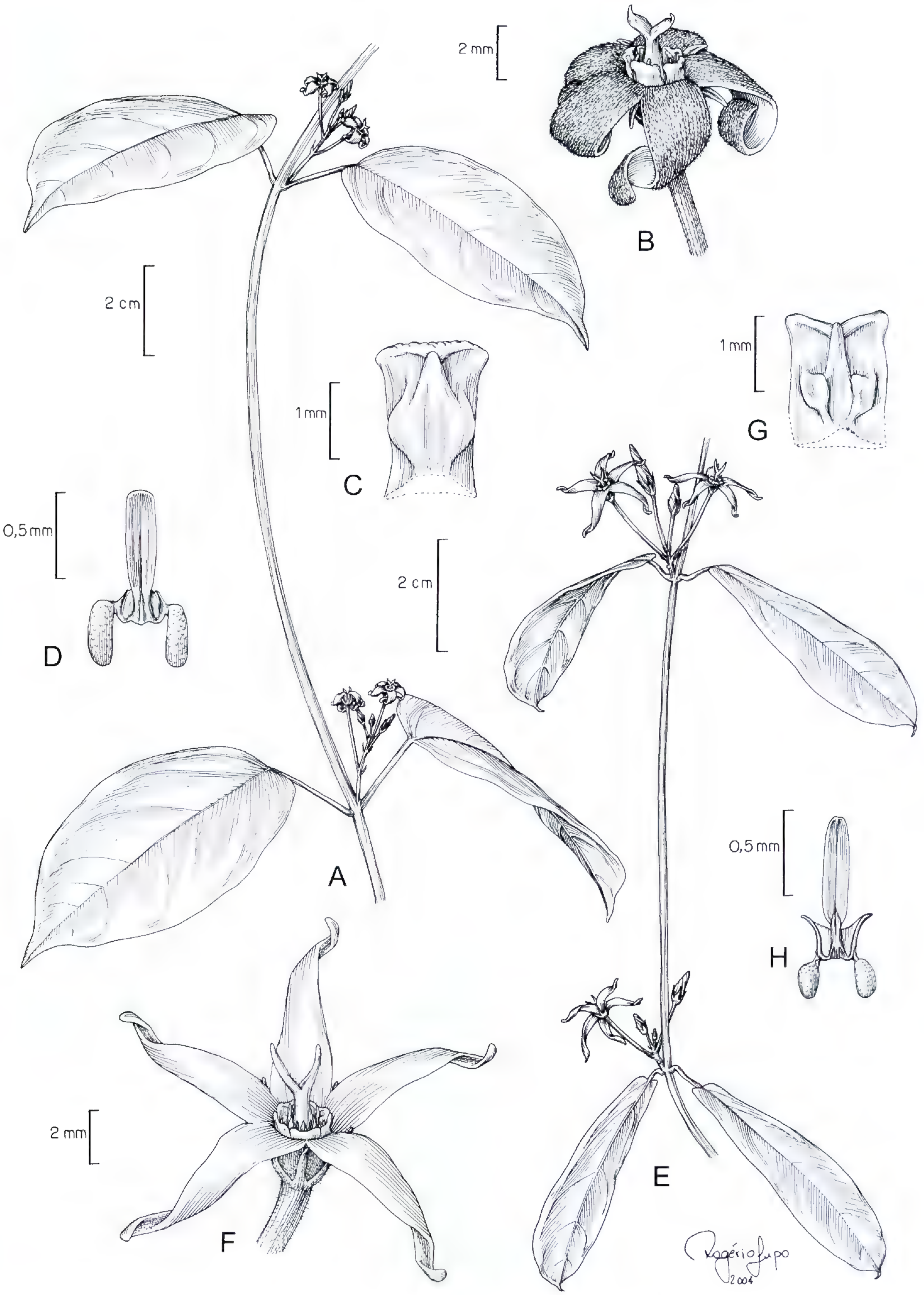

Figure 1. *Oxypetalum gyrophyllum* Farinaccio & Mello-Silva. —A. Flowering branch. —B. Flower. —C. Adaxial surface of corona lobe. —D. Pollinarium. *Oxypetalum oblanceolatum* Farinaccio & Mello-Silva. —E. Flowering branch. —F. Flower. —G. Adaxial surface of corona lobe. —H. Pollinarium. (A–D from *V. A. O. Dittrich et al. 904*, SPF; E–H from *G. Hatschbach 24431*, SPF.)

colleters at base of adaxial side. Partial inflorescence extra-axillary, alternate, racemiform, 3- to 4-flowered, erect; peduncle 1–1.4 mm long, pubescent; pedicels 1.1–1.4 cm long, tomentose; calyx greenish cream, divided almost to base, lobes 3.3–4 × 0.4 mm, linear-lanceolate, apex acute, pubescent, 1 colleter below sinus; corolla greenish cream, campanulate, tube 3.5–4 mm long, puberulent, lobes 9.5 × 2–2.2 mm, ovate-lanceolate, patent, twisted at the distal region, adaxial surface glabrous, abaxial surface puberulent, margins hyaline, apex acute; corona cream, lobes 1.6 × 1.15 mm, oblong, adaxial surface with carunculate excrescences and a central tooth-like appendage, apex emarginate, involute, gynostegium purple, 1.4 mm long, sessile; style-head white, 3.8 mm long, terete, bifid from proximal third, stems flat, divergent; anthers 1 × 0.5 mm, cubical, terminal appendage 0.7 × 0.5 mm, oblong, apex rounded, wings longer than the dorsum; corpusculum 0.7 × 0.1 mm, oblong, laminar, apex truncate, caudicles 0.08 mm long, flattened, broad, translucent, with horny teeth 0.24 mm long, curved outward, free, pollinia 0.26 × 0.11 mm, ellipsoid. Fruits and seeds unknown.

Oxypetalum oblanceolatum is immediately distinguished from all other species of the *O. insigne* group by the oblanceolate leaves, a rare character state within the genus. It is related to both *O. helios* and *O. leonii* and shares with these species the vestiture, often sparsely pubescent to glabrous, and the filiform style-head of the gynostegium, which is cup-shaped in most of the plants of the group. By the size and color of the flowers, *O. oblanceolatum* is more similar to *O. helios*. On the other hand, the corona of the new species is similar to that of *O. leonii*. The corona of both species show entire segments with a central tooth-like appendage, versus the 3-lobed segment of the corona and the lack of an adaxial appendage, which is an exclusive character state of *O. helios* in the *O. insigne* group.

Distribution, habitat, and phenology. *Oxypetalum oblanceolatum* occurs in disturbed *Araucaria angustifolia* (Bertoloni) Kuntze forests, which are known as capoeiras. A recent effort to re-collect *O. oblanceolatum* has failed because these forests have been replaced by *Glycine max* (L.) Merrill plantations. Thus, the new species could be considered as vulnerable according to IUCN (2001) Red List criteria. *Oxypetalum oblanceolatum* has been collected in flower in July.

Dedication. We dedicate this work to Gert G. Hatschbach, who first collected *Oxypetalum oblanceolatum* and many other plants, decidedly contributing to the increase of the collections and to the knowledge of the Brazilian flora.

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Literature Cited

Cáceres Moral, S. A. 1993. Dos nuevas especies en *Oxypetalum* y *Marsdenia* (Asclepiadaceae) de Argentina. Bonplandia 7(1–4): 31–382.

Decaisne, J. 1838. Estudes sur quelques genres et espèces de la famille des Asclépiadées. Ann. Sci. Nat. Bot. 2(9): 257–278, 321–348.

Farinaccio, M. A. 2002. Two new species of *Oxypetalum* (Asclepiadoideae, Apocynaceae) from Brazil. Novon 12: 446–450.

——— & R. Mello-Silva. 2004. Asclepiadoideae (Apocynaceae) do Parque Nacional da Serra da Canastra, Minas Gerais, Brasil. Bol. Bot. Univ. São Paulo 22(1): 53–92.

Fontella-Pereira, J. 1996. Contribuição ao Estudo das Asclepiadaceae brasileiras, XXVIII. Novos táxons. Pabstia 7(4): 1–4.

——— & M. C. Valente. 1993. Asclepiadaceae. Pp. 1–79 *in* J. A. Rizzo (editor), Flora dos Estados de Goiás e Tocantins, Vol. 15. Centro Editorial e Gráfico da Universidade Federal de Goiás, Goiânia, Brazil.

———, ——— & E. A. Schwarz. 1984. Contribuição ao estudo das Asclepiadaceae brasileiras, XXI. Asclepiadaceae do município de Ouro Preto, Estado de Minas Gerais—uma sinopse. Bol. Mus. Bot. Kuhlmann 7(2): 63–127.

———, G. Hatschbach & R. W. Hartmann. 1985. Contribuição ao estudo das Asclepiadaceae do Paraná III. Notas preliminares. Bol. Mus. Bot. Munic. 64: 1–47.

———, M. C. Valente, R. M. Harley & N. F. S. Marquete. 1989. Contribuição ao estudo das Asclepiadaceae brasileiras-XXIV. Checklist preliminar do Estado da Bahia. Rodriguésia 41(67): 81–115.

———, ——— & N. F. S. Marquete. 1995. Flora da Serra do Cipó, Minas Gerais: Asclepiadaceae. Bol. Bot. Univ. São Paulo 14: 131–179.

Goyder, D. J. 1995. Asclepiadaceae. Pp. 140–150 *in* B. L. Stannard (editor), Flora of Pico das Almas. Royal Botanic Gardens, Kew.

Hoehne, F. C. 1916. Monographia das Asclepiadaceae brasileiras. *Oxypetalum* et *Calostigma*. Relat. Commiss. Linhas Telegr. Estratég. Matto Grosso Amazonas 38(1): 1–131, tabs. 1–59; ib. fasc. 1; supl.: 1–13, tabs. 60–62; ib. (2): 1–29, tabs. 1–12.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Malme, G. O. A. 1927. Asclepiadaceae Dusenianae in Paraná collectae. Ark. Bot. 21A(3): 1–48.

Morillo, G. N. 1997. Asclepiadaceae. Pp. 129–177 *in* P. E. Berry, B. K. Holst & K. Yatskievych (editors), Flora of the Venezuelan Guayana, Vol. 3. Missouri Botanical Garden Press, St. Louis.

Occhioni, P. 1952. Nota sôbre o gênero *Oxypetalum* R. Brown. Descrição de uma nova espécie e nova variedade da Flóra do Itatiaia. Dusenia 3(3): 197–203.

———. 1956. Contribuição ao estudo do gênero *Oxypetalum*, com especial referência às spp. do Itatiaia e Serra dos Órgãos. Arch. Jard. Bot. Rio de Janeiro 14: 37–210, tabs. 62.

Rapini, A. 2002. *Oxypetalum rusticum* (Apocynaceae, Asclepiadoideae), a new species from the Espinhaço Range, Minas Gerais, Brazil. Novon 12: 385–387.

———, R. Mello-Silva & M. L. Kawasaki. 2001. Asclepiadoideae (Apocynaceae) da Cadeia do Espinhaço de Minas Gerais, Brasil. Bol. Bot. Univ. São Paulo 19: 55–169.

———, M. W. Chase, D. J. Goyder & J. Griffiths. 2003. Asclepiade classification: Evaluating the phylogenetic relationship of New Word Asclepiadoideae (Apocynaceae) Taxon 52: 33–50.

A New Species of *Amorphophallus* (Araceae) from Yunnan, China

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Abstract. *Amorphophallus xiei* H. Li & Z. L. Dao (Araceae), described here as new, is endemic to Yunnan Province, China, where it is locally esteemed as a food plant. The new species is illustrated and distinguished from *A. yuloensis* H. Li and *A. muelleri* Blume, to which it is most closely related.

Key words: *Amorphophallus*, Araceae, China, Yunnan.

Amorphophallus Blume ex Decaisne (Araceae) is a genus of perhaps 175 species ranging throughout tropical and subtropical regions of Africa, Madagascar, Asia, and Australasia. Dehong Prefecture, in southwestern Yunnan Province, China, is the home of an apparently endemic *Amorphophallus* species that is gathered by local people as red konjac (红魔芋) because of its red tuber and petiole and purple berries. Beginning in 1998, the local agricultural department introduced this plant to farmers for the development of konjac plantations. At present, the red konjac is a new food crop in Dehong Prefecture, where it is considered the best edible *Amorphophallus*. Surprisingly, however, it has not yet been described scientifically by botanists, a situation we here remedy.

Amorphophallus xiei H. Li & Z. L. Dao, sp. nov. TYPE: China. Yunnan: Dehong Prefecture, Longchuan County, Zhangfeng Town, E side of Nanwan river, in thickets, 900 m, 15 May 2004, *Xie Shi-Qing 110* (KUN). Figure 1.

Amorphophallo yuloense similis, sed folio bulbilis 4 ad 9 inserto, pedunculo elongato, ca. 18 cm longo, spatha spadice breviore, appendice fusiforme, flore masculo stamine unico ornato, stylo inconspicuo, stigmate majore quam ovarium, 5 vel 6-lobato, stellato, bacca purpurea differt.

Tuber 7–8 cm high, ca. 16 cm diam., depressed-globose, dark brown outside, pink inside. Leaf solitary: petiole 60–80 cm, smooth, pink at base, green to deep green distally, sometimes with some inconspicuous white spots; lamina 60–120 cm diam., developing 4 to 7(to 9) bulbils on the upper surface; leaflets to ca. 23 × 8 cm, ± elliptic, acuminate at the apex, green on the upper surface, paler on the lower surface, the main vein green on the upper surface, white on the lower surface; secondary veins numerous (ca. 40 pairs); collective vein ca. 3 mm from the margin; bulbils brown, the central one ca. 3 cm diam. (others smaller), depressed globose with many conic protuberances. Inflorescence solitary: peduncle ca. 18 cm, 1.3–1.5 cm diam., smooth, dark green, containing white latex; spathe almost erect, ca. 18 × 10 cm, campanulate, yellowish brown externally with dark brown dots, purple at the base within, minutely verruculose, and deep pink distally; spadix sessile, 23–24 cm, longer than spathe, the flowers congested; female zone 4–4.5 cm, 1.5–2.0 cm diam., cylindric, yellow; male zone 6.5–7 cm, 2.6–3.7 cm diam., slightly obconical, yellowish white; appendix ca. 11 cm, ca. 5 cm diam., spindle-shaped, conical distally, smooth, pale pink with small brown dots, dark brown distally. Female flowers with the ovary ca. 3 mm, ca. 2 mm diam., obconical, pink, unilocular, ovule 1, anatropous, the funicle erect, very short; style inconspicuous; stigma ca. 0.5 mm high, ca. 3 mm diam., larger than ovary, depressed, slightly 5- or 6-lobed, yellow; male flower with a single stamen, free, ca. 2 mm, ca. 1.5 mm diam. distally, filament ca. 1 mm, anthers ca. 1 mm, truncate, the pores apical, slightly elongate. Fruits ca. 1.5 cm long, 5 mm diam., cylindrical, green-yellow to purple.

Distribution and habitat. *Amorphophallus xiei* is known only from Longchuan County (southwestern Yunnan), in the valleys of Nanwan and Husa rivers of the Irrawaddy water system. Here it grows at altitudes of 930–1100 m in tropical thickets and at forest margins, and it is cultivated as a new food crop in farmers' plantations with lemons (*Citrus limon* (L.) Burman f.) and sweet potatoes (*Ipomoea batatas* (L.) Lamarck).

Phenology. *Amorphophallus xiei* flowers in April and May, and fruits from May through November.

This new species is closely similar to *Amorphophallus yuloensis* H. Li (1988), which is also endemic to Yunnan. Both *A. xiei* and *A. yuloensis* have tubers lacking offset development, green petioles (or with a few white spots upward), leaf blades developing bulbils, male flowers consisting of one stamen, and unilocular ovaries with a single ovule; both are distributed in tropical and subtropical areas of Yunnan. However, *Amorphophallus xiei* is different

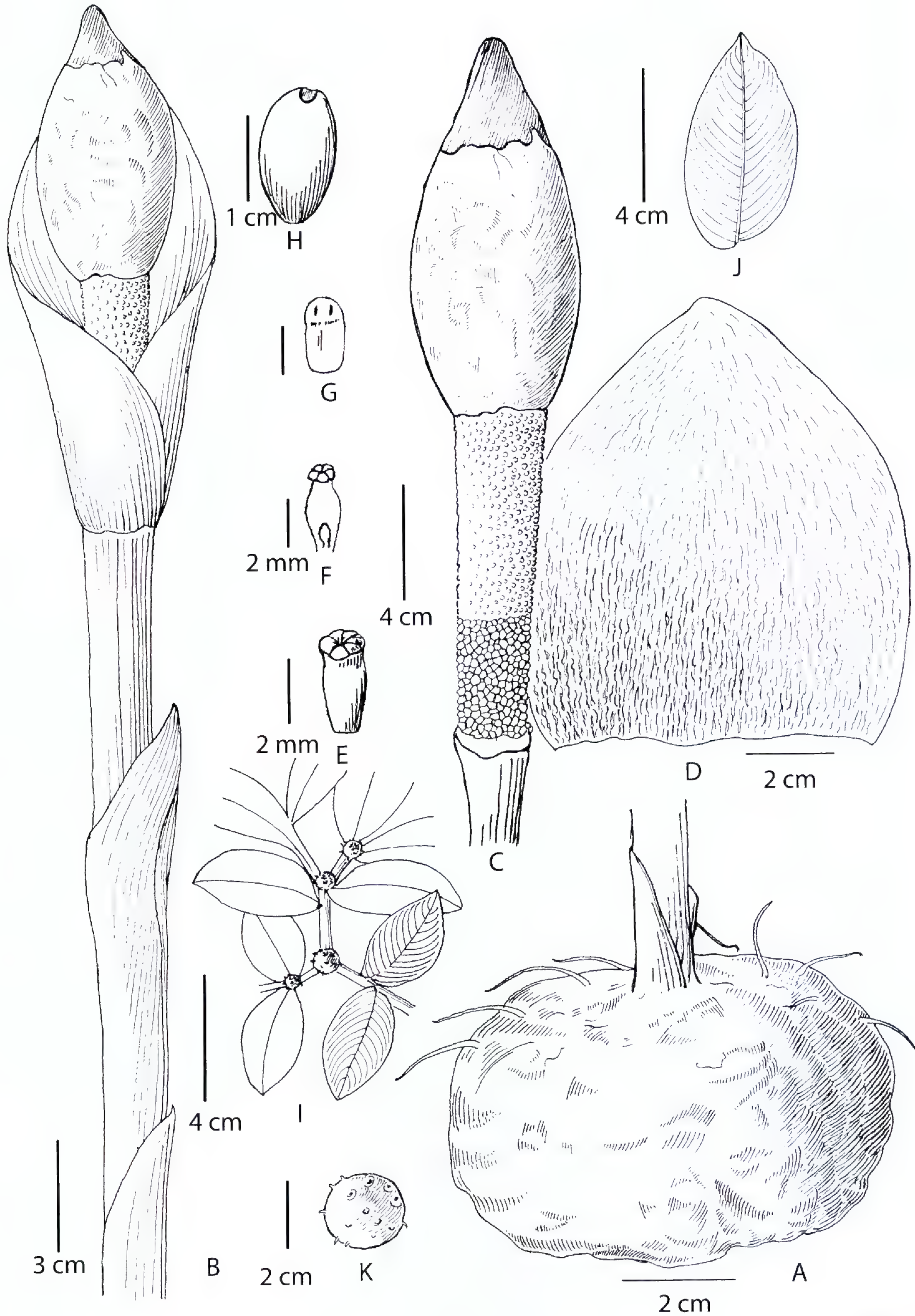

Figure 1. *Amorphophallus xiei* H. Li & Z. L. Dao. —A. Tuber. —B. Inflorescence. —C. Spadix. —D. Spathe (spread). —E. Gynoecium. —F. Gynoecium (longitudinal section). —G. Stamen. —H. Fruit. —I. Part of leaf with bulbils. —J. Leaflet. —K. Bulbil. A -G drawn from type *Xie Shiqing 110* (KUN); H from *Xie Shiqing 117* (KUN); I–K from *Li Heng et al. 458* (KUN).

Table 1. Comparison of *Amorphophallus xiei* and its morphologically related species.

Characters	*A. xiei*	*A. yuloensis*	*A. muelleri*
Tuber color inside	pink	white	yellow
Leaf petiole color	pink at base, green to deep green, without spots, rarely with inconspicuous white spots	uniformly pale green to deep green, without spots or with a few darker spots	green to almost black with numerous large elongate-elliptic, diamond shaped or stripelike, pale green spots, and sometimes with an additional high number of small, pale green spots
Leaf bulbil	4 to 7(to 9)	1	4 and more
Peduncle	ca. 18 cm long	6–7.5 cm	30–60 cm
Spathe form	campanulate, without constricted zone	navicular, without constricted zone	constricted between the tube and limb, tube strongly convolute, limb funnelform
Spathe color	yellowish brown outside, purple at the base within, and pink distally	pale green to pink outside, pale pink at the base within and cream distally	pale green to brownish purple with large white spots outside, dark pink at the base within, and purplish with pale brown oval spots
Spadix	longer than spathe	shorter than spathe	much longer than spathe
Male flower	a single stamen	a single stamen	3 or more stamens
Female flower	ovary unilocular with a single ovule	ovary unilocular with a single ovule	ovary 2- to 3-locular
Stigma	5- or 6-lobed	entire, discoid	
Berry	purple	blue	deep red
Spadix appendix	spindle-shaped	cylindric, conical	long conical
Distribution	southwestern Yunnan, China	southern to central Yunnan, China	tropical Asia: from Andamans through Myanmar, Thailand, to Sumatra, Java

in having 4 to 7(to 9) bulbils on the upper surface of the leaves, the spathe shorter than the spadix, a spindle-shaped spadix appendix, female flowers with the style inconspicuous and the stigma yellow, ca. 0.5 mm high and ca. 3 mm diam., larger than the ovary, depressed, slightly 5- or 6-lobed, and purple fruits (Table 1). Moreover, living plants of *A. xiei* are easily distinguished from *A. yuloensis* by various other characters. The tubers of *A. xiei* are dark brown outside and pink within, but those of *A. yuloensis* are black or dark brown outside and white within; the petioles of *A. xiei* are pink at the base and green to deep green distally (sometimes with some inconspicuous whitish spots), while those of *A. yuloensis* are green, very rarely "with a few darker striations/spots" (Hetterscheid & Ittenbach, 1996: 126).

Both *Amorphophallus xiei* and *A. yuloensis* may be affined to *A. muelleri* Blume by producing bulbils on the leaves and not offset from the tuber, but *A. xiei* and *A. yuloensis* differ by having male flowers consisting of one stamen and female flowers with a unilocular ovary. Moreover, *A. muelleri* has a spadix much longer than the spathe, a peduncle, at 30–60 cm, as long as the petiole, a spathe with "base strongly convolute and slightly or clearly constricted at the top..." (Hetterscheid & Ittenbach, 1996: 102), while the spadix of *A. xiei* and *A. yuloensis* is a little longer than the spathe and shorter than the spathe, respectively, the peduncle is short (ca. 18 cm and 6–7.5 cm), the spathe is campanulate and navicular, slightly convoluted at the base, never constricted between the tube and the limb as in *A. muelleri*. The spathe of *A. xiei* and *A. yuloensis*, which mostly lacks dots or spots on both sides, is also different from that of *A. muelleri*, which is described as having "outside base pale green or pale dirty pinkish with, usually transversely elongate, whitish spots and few small, blackish green dots..." (Hetterscheid & Ittenbach, 1996: 103). See Table 1.

Paratypes. CHINA. **Yunnan:** Dehong Prefecture, Longchuan County, Zhangfeng Town, W side of Nanwan river, *Xie Shi-Qing 111* (MO); Husa Village, *Xie Shi-Qing 112* (KUN); cultivated in an *Amorphophallus* plantation, *Xie Shi-Qing 117* (KUN), *Li Heng et al. 458* (KUN, MO).

Etymology. The species is named in honor of Professor Xie Shi-Qing of the Yunnan Agriculture University (YAU), the director of Institute of Amorphophallus YAU, and the director of Tuberroot Crops Research and Training Center of Southeast Asia, for his friendship with the authors and his fine skills in growing *Amorphophallus*. He also collected many *Amorphophallus* species from China as well as from Myanmar and Laos; furthermore, he helps Yunnan farmers to develop *Amorphophallus* plantations.

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Literature Cited

Hetterscheid, W. L. A. & S. Ittenbach. 1996. Everything you always wanted to know about *Amorphophallus*, but were afraid to stick your nose into!!!!! Aroideana 19: 7–131.

Li, H. 1988. New taxa of the genus *Amorphophallus* from Yunnan. J. Wuhan Bot. Res. 6: 209–214.

A New Species of *Camellia* Section *Piquetia* (Theaceae) from Vietnam

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ABSTRACT. A new species of *Camellia* (Theaceae) endemic to the Dalat Plateau in southern Vietnam is described and illustrated: *Camellia dongnaiensis*. The newly described species has large pendulous, narrowly obovate leaves; two whorled, waxy, pendulous flowers exhibiting emarginate, graduated yellow-apricot to intensely pink petals; peduncles distinctly wider at the proximal end; a compound style consisting of six parts that are fused at the base for one third of their length; persistent bracteoles; and a superior five-chambered ovary. The morphological evidence supports taxonomic placement in *Camellia* sect. *Piquetia* (Pierre) Sealy.

Key words: *Camellia dongnaiensis*, *Camellia piquetiana*, IUCN Conservation Status, Theaceae, Vietnam.

Camellia L. is a member of the tea family (Theaceae). This genus is well represented in Vietnam, and its species are located throughout most areas of the country. Vietnam is considered a major center of diversity for *Camellia*, having approximately 20% of all the species located within its boundaries (Sealy, 1958; Chang & Bartholomew, 1984). The genus *Camellia* is characterized within the family by having seeds without wings and capsules dehiscing from the apex (Sealy, 1958).

In this paper, a new species within *Camellia* sect. *Piquetia* (Pierre) Sealy from Vietnam is described. This section was originally established by Pierre in 1887 and contains one species only, *C. piquetiana* (Sealy, 1958; Chang & Bartholomew, 1984; T. Ninh, unpublished data, 2002). A concise description of *Camellia* sect. *Piquetia* follows:

Camellia sect. **Piquetia** (Pierre) Sealy, Rev. Gen. *Camellia*. 108. 1958. *Thea* sect. *Piquetia* Pierre, Fl. Forest. Cochinch. fasc. 8, t. 119. 1887. TYPE: *Camellia piquetiana* (Pierre) Sealy.

Perennial shrubs. Leaves 29–42 × 9.5–12.5 cm. Flowers borne on short shoots in the axils of the leaves, usually 3 to 5 flowers on a shoot, but sometimes 1 only. Flowers pedunculate, nodding; peduncle very stout, thickened upward, bracts 2 or 3, persistent; sepals 5, persistent; petals 8 or more, stamens free above the union with the petals, puberulous inside, gynoecium densely pubescent; indumenta consistent; styles 5(or 6), free. Leaf blades 290–420 × 95–125 mm.

Camellia dongnaiensis Orel, sp. nov. TYPE: Vietnam. Lam Dong Prov.: unnamed tributary, the headwaters of Dong Nai river, 17 Jan. 2004, *G. Orel, G. Richards, A. Curry & G. Wilkes 21148* (holotype, NSW; isotypes, NSW, HN). Figure 1.

Camelliae piquetianae affinis sed characteribus sequentibus differt: frutex mediocris; folia juvenilia minora aurantiaca vel cupreo-rubra; folia semper pendula costa ad angulum 45 ad petiolum portata; alabastra acute ellipsoidea plerumque virides pigmento vix suffusa; flores majores petalis rigidulis ceraceisque, luteolis ad armeniacis margine rosea.

Perennial, small to medium evergreen shrub to 2.5 m high; sparsely branched, sometimes multi-stemmed, semi-upright habit; twigs glabrous, green toward terminals, with brown-gray patches, turning entirely light brown on semimature branches; older branches and trunk light brown and slightly furrowed. Leaf petiole curved and concave, slightly flattened, thick, of same color as the leaf on all sides, to 20 × 8 mm, to 6 mm thick; petiole attached at 45 angle to midrib; leaf lamina continues as a 2-mm high ridge on each side of adaxial petiole; leaf buds light green, axillary, shiny, falcate with sharp, curved apex, 10–15 mm long; developing leaves soft and pendulous, dull green, with distinct orange-coppery sheen when fully developed but still young. Mature leaves irregularly serrate, undulate, to 44 × 14 cm; oblique on abaxial side; lamina coriaceous, narrowly obovate, leaf apex acute to cuspidate, base acute to partially rounded; adaxial leaf surface glabrous, deep green, shiny, lighter green and dull below; blade midrib to 8 mm proximally, less than 1 mm distally, light green and dull; venation pinnate, secondary veins brochidodromous, with up to 22 pairs of veins adaxially sunken, abaxially prominent; tertiary venation dense, craspedodromous (Roth-Nebelsick et al., 2001). Floral peduncle 25–30 mm long, glabrous, axillary, occasionally terminal, pendulous, dark green, wider at the proximal end; flowers axillary, solitary; flower buds

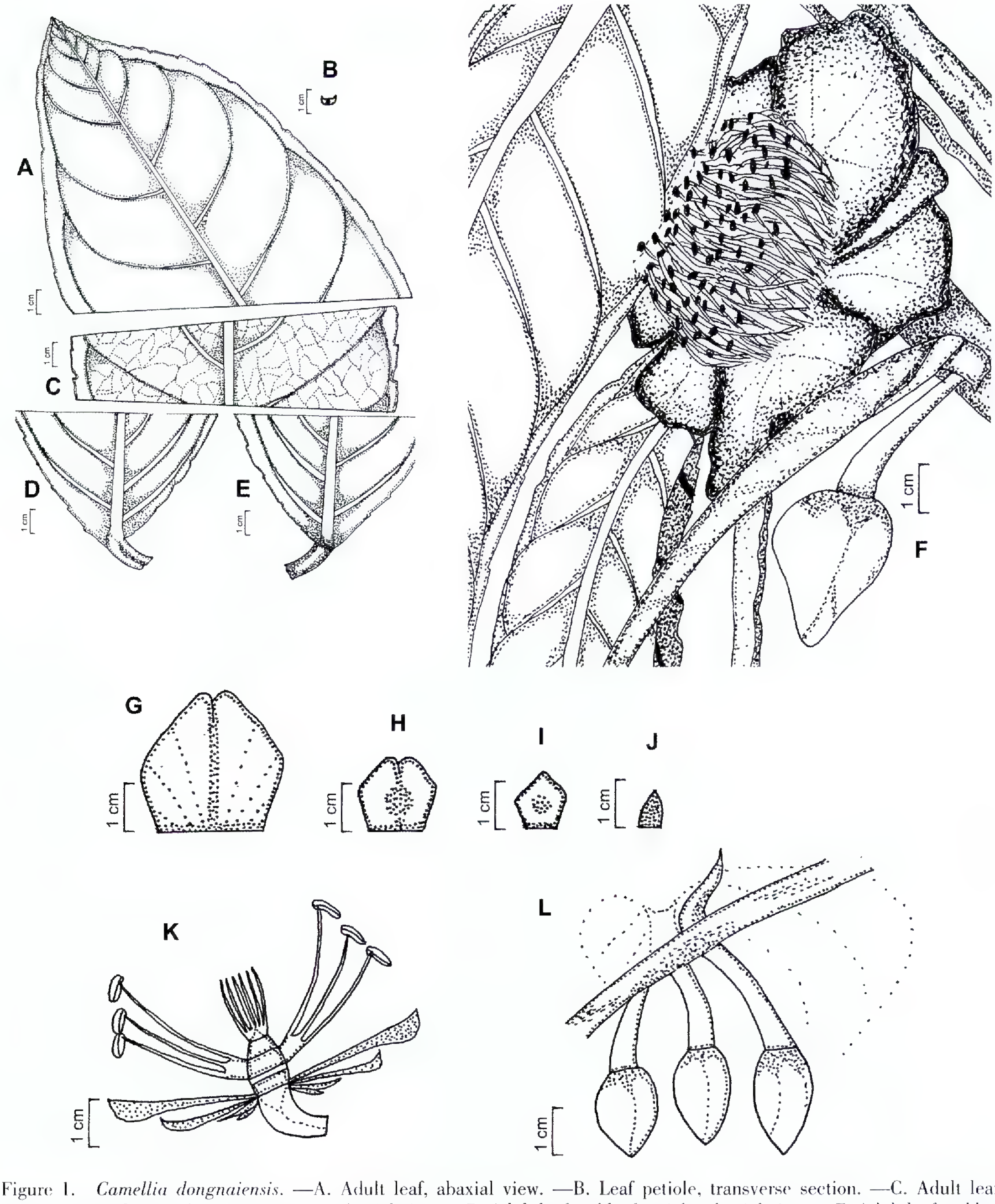

Figure 1. *Camellia dongnaiensis*. —A. Adult leaf, abaxial view. —B. Leaf petiole, transverse section. —C. Adult leaf, primary, secondary, and tertiary venation, abaxial view. —D. Adult leaf and leaf petiole, abaxial view. —E. Adult leaf and leaf petiole, adaxial view. —F. Holotype of *C. dongnaiensis*. —G. Petal, first whorl. —H. Petal, second whorl. —I. Sepal. —J. Bract. —K. Lateral view of adult flower, showing all flower parts. —L. Branch with flower buds and a leaf bud. Drawn from the holotype *G. Orel et al. 21148*.

pendulous, mostly green, in groups of 3 to 5 buds, seldom solitary; flowers 40–75 mm diam., waxy and rigid, petals emarginate, graduated yellow-apricot in color, with a distinct and intense pink margin 3–5 mm wide; petals arranged in 2 whorls of 5 and 3, respectively; first whorl with petals 30 × 30 mm, concave, sometimes asymmetric, of pentagonal shape, emarginate, petal edges sometimes ruffled; petal striations slightly raised and of the same color as petal, not visible abaxially; petals overlapping, 3 on top, 2 partially obscured on the bottom of the whorl; second (3 petal) whorl with petals 15–20 × 15–20 mm, concave, sometimes asymmetric, of pentagonal shape, distinctly emarginate, petal edges with

ruffles; petal striations similar to first whorl; petals not overlapping; pink pigmentation present not only on the edges, but also diffused throughout the petal; sepals 3, pentagonal, not emarginate, dark green in the middle, with edges of lighter green, turning to light yellow, 12 × 12 mm; bracteoles 3, persistent, external to sepals; pentagonal, ca. 5 × 5 mm, dark green and tightly adpressed to sepals, bracteole bases arise from 0.2-mm deep indentation where attached to petiole; stamens are numerous (300) to very numerous (500), in a circular formation, 35–40 mm diam.; filaments 15–20 mm, yellow, fused in bottom third; anthers bright yellow, with a single dark brown-black line joining the distal and proximal ends; style is compound, proximally 6-parted, but fused at the base, 15 mm, bright yellow, each with an indistinct stigma of the same color; ovary superior, 5(6) carpellate, each carpel bilocular; gynoecium is 10–12 × 8–10 mm. Fruit and seed not seen.

Phenology. Collected in flower in January. Fruiting and seeding period unknown.

Etymology. The specific epithet refers to the geographical location of the find and is derived from the name of the river Dong-Nai situated on Dalat Plateau, southern Vietnam.

Distribution. Species known only from the type collection taken from a single individual. Species provenance details withheld for conservation reasons.

IUCN Conservation Status. Insufficiently known (K).

Phytogeographic and Taxonomic Remarks

This endemic species is only known from the type collection taken from single individual, which appears to be confined to a small mountainous area of dense rainforest. No paratypes exist. Further searching of the relevant area is required. The author was not able to find another specimen of *Camellia dongnaiensis* in any Vietnamese herbarium.

Morphologically the new species shares a number of characteristics with other Vietnamese *Camellia* species, e.g., waxy and rigid flowers like those of *C. amplexicaulis* (Pitard) Cohen-Stuart and the yellow-flowered species *C. cucphuongensis* Tran Ninh & J.-C. Rosmann and *C. impressinervis* H. T. Chang & S. Y. Liang (Ho, 1991; T. Ninh, unpublished data, 2002; Gao et al., 2005); emarginate petals like those of *C. vidalii* J.-C. Rosmann and *C. changii* C. X. Ye (including *C. azalea* C. F. Wei, Gao et al., 2005); and leaf size like that of *C. krempfii* (Gagnepain) Sealy (Chang & Bartholomew, 1984; T. Ninh, unpublished data, 2002). The pedunculate flowers with numerous filaments and persistent bracts, curved leaf petioles, and pinnate leaf venation are characteristics shared with *C. piquetiana*, as is the habitat of tall, subtropical rainforest. Both species form a part of a dense understory layer and grow in low light, high humidity conditions in nutrient-poor soils.

However, the new species *Camellia dongnaiensis* is well distinguished from *Camellia piquetiana*, previously the sole species in section *Piquetia*, by a number of morphological characteristics. *Camellia dongnaiensis* is a medium-sized, semi-pendulous shrub 2.5 m tall (not a small, upright tree to 8 m), with juvenile leaves orange to coppery red (not dark purple to black) and mature leaves 440 × 140 mm (not 550 × 150 mm). The new species has consistently pendulous leaves, leaf petiole angled at 45 angle to midrib (not straight or slightly angled), flower buds pointed and ellipsoidal (not globose), flower buds mostly green, with small traces of pigment (not purple, almost black and heavily pigmented), flower diameters 40–75 mm (not 30–50 mm), flower color a graduated yellow-apricot with an intense pink margin (not a uniform dark purple-pink), and waxy and rigid flowers (not soft and lacking wax).

The newly described species also shares morphological affinity with *Camellia vidalii*; however, *C. dongnaiensis* differs from the latter in a number of key morphological characteristics. *Camellia dongnaiensis* is a small shrub to 2.5 m tall, not a larger shrub to 4.5 m (Rosmann, 1999; Gao et al., 2005). The curved, slightly flattened leaf petioles are attached at a 45 angle to midrib, a feature not observed in *C. vidalii*. The leaf size of *C. dongnaiensis* (440 × 140 mm) differs from the narrower blades of *C. vidalii* (360 × 60 mm). The narrowly obovate leaf shape (not elliptic–oblong elliptic), the variable acute to cuspidate leaf apex (not acuminate with a distinct 10 mm acumen), and the acute to partially rounded leaf base (not rounded or angular) clearly distinguishes *C. dongnaiensis* from *C. vidalii* (Rosmann, 1999). Furthermore, the peduncles of *C. dongnaiensis* are distinctly widened at their proximal end, a feature generally not observed in *C. vidalii*; this characteristic is best observed on unopened flower buds. The distinct flower color of *C. dongnaiensis* (graduated yellow-apricot with a distinct intense pink margin) is perhaps the most notable feature that distinguishes the newly described species from *C. vidalii*, the latter with flowers light or chromium yellow (Rosmann, 1999; Gao et al., 2005). There are three petals in the second whorl of *C. dongnaiensis* flowers and five in *C. vidalii* (Rosmann, 1999), a feature that further distinguishes the newly described species, *C. dongnaiensis*.

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Literature Cited

Chang, H. T. & B. Bartholomew. 1984. Camellias. Timber Press, Portland.

Gao, J., C. R. Parks & Y. Du. 2005. Collected Species of the Genus *Camellia*: An Illustrated Outline. Zhejiang Science and Technology Press, Zhejiang.

Ho, P.-H. 1991. Câycỏ Việtnam, Vol 1, Part 1. Mekong Printing, Santa Ana, California.

Pierre, J. B. L. 1887. Flore Forestière de la Cochinchine, fasc. 8. Octave Doin, Paris.

Rosmann, J.-C. 1999. Une nouvelle espèce de *Camellia* (Theaceae) du Viet-Nam. Adansonia 21: 319–322.

Roth-Nebelsick, A., D. Uhl, V. Mosbrugger & H. Kerp. 2001. Evolution and function of leaf venation architecture: A review. Ann. Bot. 87: 553–566.

Sealy, J. R. 1958. A Revision of the Genus *Camellia*. Royal Horticultural Society, London.

New Species of *Cybianthus* Martius (Myrsinaceae) from the Hylaean/Andean Interface of Peru

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Abstract. Two new Peruvian species of *Cybianthus* Martius (Myrsinaceae), *C. tayoensis* Pipoly & Ricketson, of subgenus *Cybianthus*, from Amazonas, and *C. candamoensis* Pipoly & Ricketson, of subgenus *Weigeltia* A. DC., from Puno, are described and illustrated. *Cybianthus tayoensis* may be recognized by its terete branchlets; leaf blades 6–7 cm wide with adaxial surface showing prominulous secondary veins; and reddish flowers with calyx 1–1.2 mm long, widely ovate lobes, and entire margins. *Cybianthus candamoensis* is easily recognized by its chartaceous, elliptic leaf blades with acuminate apices; petioles 2–2.5 cm long; staminate flower pedicels 1–1.2 mm long; and calyx unequally divided, lobes deltate to subdeltate or widely ovate, 0.7–1 × 0.7–1.2 mm, margins irregular to somewhat erose apically, corolla lobes 1–1.5 × 1–1.3 mm, with margins entire. Formal conservation assessments are reported for each.

Resumen. Se describen e ilustran dos especies nuevas peruanas pertenecientes al género *Cybianthus* Martius (Myrsinaceae), *C. tayoensis* Pipoly & Ricketson, del subgénero *Cybianthus*, proveniente del Departamento de Amazonas, y *C. candamoensis* Pipoly & Ricketson, del subgénero *Weigeltia* A. DC., proveniente del Puno. *Cybianthus tayoensis* se puede reconocer por sus ramitas teretes, las láminas 6–7 cm de ancho, con las venas secundarias ligeramente prominentes en la haz, las flores rojizas, el cáliz 1–1.2 mm de largo, con los lóbulos aovados y con márgenes enteros. *Cybianthus candamoensis* se reconoce fácilmente por sus hojas cartáceas y elípticas con ápices acuminados, los pecíolos 2–2.5 mm de largo, los pedicelos de las flores estaminadas 1–1.2 mm de largo, el cáliz no igualmente dividido, los lóbulos deltados o subdeltados o anchamente aovados, 0.7–1.0 × 0.7–1.2 mm, los márgenes irregulares hasta algo erosos hacia el ápice, los lóbulos corolinos 1.0–1.5 × 1.0–1.3 mm, con los márgenes enteros. Se presentan evaluaciones para la conservación de cada especie.

Key words: Amazonas, Bagua, Candamo, Carabaya, *Cybianthus*, Flora del Río Cenepa Project, IUCN conservation status, Myrsinaceae, Peru, Puno.

The genus *Cybianthus* Martius was cladistically defined by the presence of unique glandular granules at the junction of the corolla tube and lobes by Pipoly (1987). In addition, the unique combination of lateral (axillary) inflorescences, gamosepalous and gamopetalous flowers, and stamens connate by their filaments at least one-fourth their length and adnate to the corolla tube at least one-third its length (Pipoly, 1987, 1992, 1998) allows for practical recognition from herbarium specimens. With the current contribution, *Cybianthus* now contains 169 species in 10 subgenera. The genus includes species formerly included in the genera *Comomyrsine* Hooker f., *Conomorpha* A. DC., *Correlliana* D'Arcy, *Cybianthopsis* (Mez) Lundell, *Grammadenia* Bentham, *Microconomorpha* (Mez) Lundell, and *Weigeltia* A. DC. (Pipoly, 1987, 1992, 1998). Among 36 species occurring in Peru, 14 are endemic (including those described here).

While preparing the taxonomic treatment of *Cybianthus* for inclusion in the Myrsinaceae for the Flora del Río Cenepa Project, a new species from the District of Bagua in the Department Amazonas, Peru, was discovered within *Cybianthus* subg. *Cybianthus*. In addition, during routine identification of Peruvian material of Myrsinaceae, a new species from Puno was discovered within *Cybianthus* subg. *Weigeltia*.

Cybianthus tayoensis Pipoly & Ricketson, sp. nov. TYPE: Peru. Amazonas: Bagua Prov., Cerro Tayo, ca. 1 hour from Chiriaco, 05 15′56″S, 78 22′W, 800 m, 19 Mar. 2001 (stam fl), *H. van der Werff, R. Vásquez & B. Gray 16229* (holotype, MO; isotypes, FTG, USM not seen). Figure 1.

Haec species quoad ramulos trichomata biramulosa indutos, racemos erectosque simplices, nervaturas foliares

brochidodromas, petiolos aliquantum pulvinatos, necnon lobos corollinos suborbiculares *Cybiantho ruforamulo* valde arcte affinis, sed ab ea ramulis teretibus (non angulatis), laminis 6–7 (non 2–3.5) mm latis, venis secundariis adaxialibus prominulis (nec bullatis vel impressis), floribus rubris (non viridibus), calycibus 1–1.2 (non 1.2–1.4) mm longisque lobis late ovatis (nec suborbicularibus) denique marginibus integerrimis (nec erosis) praeclare distat.

Shrub 2 m tall; all vegetation portions densely rufous-stellate-tomentose, the trichomes bi- to quadriramose (Y-shaped to 4-armed). Branchlets terete, 3.5–5 mm diam. Leaves pseudoverticillate; blades coriaceous, narrowly oblanceolate, 22.5–30 × 6–7.4 cm, apically long-acuminate, the acumen 1–3 cm long, basally attenuate, not decurrent on the petiole, dull adaxially, pallid abaxially, conspicuously black punctate and punctate-lineate adaxially and abaxially, densely tomentose on midrib adaxially and throughout abaxially, midrib raised and canaliculate adaxially, prominently raised abaxially, veins brochidodromous, the secondary veins 16 to 24 pairs, prominulous adaxially, prominently raised abaxially, with numerous rubiginous hydropotes abaxially, the margin flat except somewhat inrolled basally at maturity; petioles semiterete, the upper surface flat, 1–1.5 cm long, short-pulvinate, densely tomentose, persistent. Staminate inflorescence: an erect raceme 11–25 cm long, the rachis densely rufous-stellate-tomentulose; inflorescence bract unknown; floral bracts chartaceous, linear-subulate, 2.2–2.6 × 0.2–0.3 mm, apically long-attenuate, densely tomentulose, the margins densely glandular-ciliate; pedicels terete, 1.2–1.5(–2) mm long, densely tomentulose. Staminate flowers pendent at maturity, 4-merous, coriaceous, reddish, 1.8–2.2 mm long; calyx cotyliform, deeply divided, 1–1.2 mm long, tube 0.1–0.2 mm long, lobes ovate, 0.8–0.9 × 0.5–0.6 mm, apically obtuse, densely and prominently black punctate, punctations crowded and appearing verrucose except along margins, margins scarious, irregular, glandular-ciliate; corolla subrotate, 1.8–2 mm long, translucent, glabrous without, glandular-granulose throughout within, tube 0.7–0.8 mm long, lobes suborbicular, 1.2–1.3 × 1.1–1.3 mm, apically obtuse, not notched, densely and prominently black punctate and appearing verrucose adaxially, margin thickened, somewhat irregular, glandular-ciliate, entire; stamens 1–1.2 mm long, the filaments developmentally fused to the corolla (veins visible in clearings), anthers appearing sessile, widely obcordate, proximally reflexed, 0.5–0.6 × 0.7–0.8 mm, apically obtuse, basally deeply cordate, apically dehiscent by apical pores, pores confluent (bi-rimose) at maturity, the connective densely and prominently black punctate dorsally; pistillode irregular, hollow, vestigial, ca. 0.1–0.3 mm long, 0.1 mm diam. Pistillate inflorescence, flowers and fruit unknown.

Distribution. *Cybianthus tayoensis* is endemic to Cerro Tayo, a sandstone formation resembling a tepuí on the eastern side of the northern Peruvian Andes, ca. 200 km south of the Cordillera del Condor and its related sandstone mountain complexes along the Ecuadorean–Peruvian border, growing at 800 m elevation.

Ecology and conservation assessment. *Cybianthus tayoensis* is an apparent point endemic, along with another 45 putative taxa being described as new to science (Rodolfo Vásquez, pers. comm.) as part of the Flora del Río Cenepa Project at the Missouri Botanical Garden. These formations are unique because they are composed of sandstone peaks covering calcareous caves below. The entire basin has been known as a center of endemism for Myrsinaceae and many other families (Pipoly, 1998). The TROPICOS database indicates that almost 20,000 specimens have been collected in the region; it is somewhat unlikely that more populations of this species will be found. According to IUCN (2001) Red List criteria, this species would be critically endangered (CRB2aD) owing to (B) area of occupancy estimated to be less than 10 km^2 and (2a) known only from one collection, so (D) the total population size is estimated at less than 50 mature individuals. This area is largely governed by local indigenous groups with varying land stewardship philosophies, making the species and its habitat unprotected. A landslide or other climatic event could decimate currently known populations.

Etymology. The specific epithet refers to the type locality, Cerro Tayo.

Cybianthus tayoensis belongs to *Cybianthus* subg. *Cybianthus*, which is circumscribed by leaves petiolate, apically acute, acuminate, or caudate, basally acute, attenuate, or cuneate, the margins opaque; petioles obsolete or not abruptly swollen basally; corolla rotate to subrotate; staminal tube developmentally fused to corolla tube, the stamens thus appearing epipetalous; and anthers wider than long, erect, apically rounded to truncate or emarginate, basifixed, and poricidally dehiscent. Based on its branched trichomes, simple erect raceme, brochidodromous leaf venation, somewhat pulvinate petioles, and corolla lobes as wide as long or slightly wider, *C. tayoensis* is most closely related to *C. ruforamulus* Pipoly from the Colombian Amazon. However, *C. tayoensis* may be recognized by its terete (not angulate) branchlets, leaf blades 6–7 (not 2–3.5) cm wide with adaxial surface showing prominulous secondary veins (not bullate with impressed veins), reddish (not green) flowers, and calyx 1–1.2 (not 1.2–1.4) mm long with widely ovate (not suborbicular) lobes and entire (not erose) margins. This species is so similar to *C. ruforamulus*

Figure 1. *Cybianthus tayoensis* Pipoly & Ricketson. —A. Flowering branch. —B. Staminate flowers. Drawn from the holotype (*H. van der Werff, R. Vásquez & B. Gray 16229*, MO).

and so distinct from the rest of the subgenus that we do not hesitate to describe it based on staminate material alone. Our experience indicates that the pistillate plant, when found, will have the somewhat pulvinate petioles, branched trichomes, brochidodromous venation, terete branchlets, and widely ovate calyx lobes with entire margins, although the size of the floral parts will probably be smaller.

Cybianthus candamoensis Pipoly & Ricketson, sp. nov. TYPE: Peru. Puno: Carabaya Prov., headwaters of the río Candamo, 13°25′S, 69°55′W, 400 m, 10 Mar. 1997 (stam fl), *F. Cornejo & A. Balarezo 2947* (holotype, MO; isotype, MOL not seen). Figure 2.

Haec species propter ramulos angulatosque minute rubiginoso-furfuraceo-lepidotosque 6 mm diametros grandiores, laminas chartaceas, corollas membranaceas secus margines loborum ad bases abrupte constrictas denique inflorescentia bipinnata, *Cybiantho vasquezi* arcte affinis, sed ab ea laminis chartaceis (non coriaceis), ellipticis (nec oblanceolatis), ad apices acuminatis (nec acutis vel subacuminatis), petiolis 2–2.5 (non 2.5–3) mm longis, pedicellis 1–1.2 (non 0.3–0.5) mm longis, calycibus inaequaliter (nec aequaliter) divisis, lobis calycinis deltatis vel subdeltatis vel late ovatis (nec ovatis), 0.7 -1 × 0.7–1.2 (nec 1.2–1.4 × 1 1.1) mm, secus margines aliquantum erosis (nec crenatis), lobis corollinis 1–1.5 × 1–1.3 (non 2–2.3 × 1.7–1.8) mm, secus margines integerrimis (nec crenatis) statim distinguitur.

Shrub to 1.5 m tall. Branchlets angulate, 5–7 mm diam., minutely rubiginous-furfuraceous-lepidote and glandular-granulose, glabrescent. Leaves mixed, alternate, and pseudoverticillate; blades chartaceous, elliptic, (18–)20–34(–37.2) × (7.2–)10–15.5 cm, apically abruptly acuminate to cuspidate, the acumen 1–2 cm long, sordid adaxially, inconspicuously black punctate and bearing numerous minute rubiginous lepidote scales abaxially, venation brochidodromous, midrib elevated and somewhat canaliculate adaxially, prominently raised abaxially, secondary veins 10 to 12 pairs, prominulous adaxially, prominently raised abaxially, the margin entire, somewhat irregular, flat, decurrent on the petiole; petioles canaliculate, 2–2.5 cm long, bearing numerous rubiginous-lepidote scales, swollen basally to 3 mm at base. Staminate inflorescence: a bipinnate panicle, erect to 13 cm long; inflorescence bract unknown; secondary branch bracts unknown; floral bracts membranous, linear-subulate, 1.8–2 × ca. 0.2 mm, translucent, scattered black punctate, stellate tomentulose, the margin irregular, entire, glandular-ciliate; pedicels terete, 1–1.2 mm long, densely rufous-glandular-papillose. Staminate flowers: membranous, 4-merous, 1.6–1.8 mm long; translucent white; calyx cotyliform, 1–1.2 mm long, unequally divided, tube 0.25–0.5 mm long, lobes deltate to subdeltate to widely ovate, 0.7–1 × 0.7–1.2 mm, apically acute to a rounded tip, with 2 to 3 prominent black punctations, sparsely glandular-papillose, margin irregular to somewhat erose apically, glandular-ciliolate; corolla subrotate, 1–1.2 mm long, tube 0.4–0.5 mm long, densely glandular-granulose within, lobes very widely ovate to suborbicular, 1–1.5 × 1–1.3 mm, apically obtuse to rounded, abruptly constricted basally, densely glandular-granulose medially within toward base, margins hyaline, flat, glabrous; stamens subequal or equal to the corolla, 1.6–1.8 mm long, staminal tube 0.4–0.5 mm long, filaments flat, proximally recurved, 0.7–0.8 mm long, anthers obloid, 0.4–0.5 × 0.6–0.7 mm, apically broadly rounded, the connective minutely and prominently black punctate dorsally; pistillode obturbinate, hollow, 0.5–0.6 mm long, 0.5–0.6 mm diam. Pistillate inflorescence, flowers, and fruit unknown.

Distribution. *Cybianthus candamoensis* is endemic to the headwaters of the Río Candamo, a tributary of the Río Tambopata, in a valley that winds among isolated ridges of 1000 and 2000 m, on the northern slopes of the southernmost Peruvian Andes north of Lake Titicaca on the Peru-Bolivia border, 400–600 m elevation.

Ecology and conservation assessment. *Cybianthus candamoensis* is an apparent point endemic, along with another two dozen putative taxa being described as new to science (Vásquez, pers. comm.). The area of distribution of *C. candamoensis*, together with the Río Tambopata area, comprises the Tambopata–Candamo Reserve, which is the subject of studies carried out by several conservation organizations and the Missouri Botanical Garden (Vásquez, pers. comm.) owing to its high rate of endemism. According to IUCN (2001) Red List criteria, this species would be critically endangered (CRB2aD) owing to (B) area of occupancy estimated to be less than 10 km^2 and (2a) known only from one collection, so (D) the total population size is estimated at less than 50 mature individuals. While a certain level of protection is afforded the area, there are insufficient personnel to protect it. It is possible that even a climatic event could decimate currently known populations.

Etymology. The specific epithet refers to the type locality, the Río Candamo.

Cybianthus candamoensis belongs to *Cybianthus* subg. *Weigeltia*, which is circumscribed by the following characters: plants polyaxial; petioles abruptly swollen basally; corolla rotate to subrotate; and anthers wider than long, erect, apically rounded to truncate or emarginate, dorsifixed, versatile, and

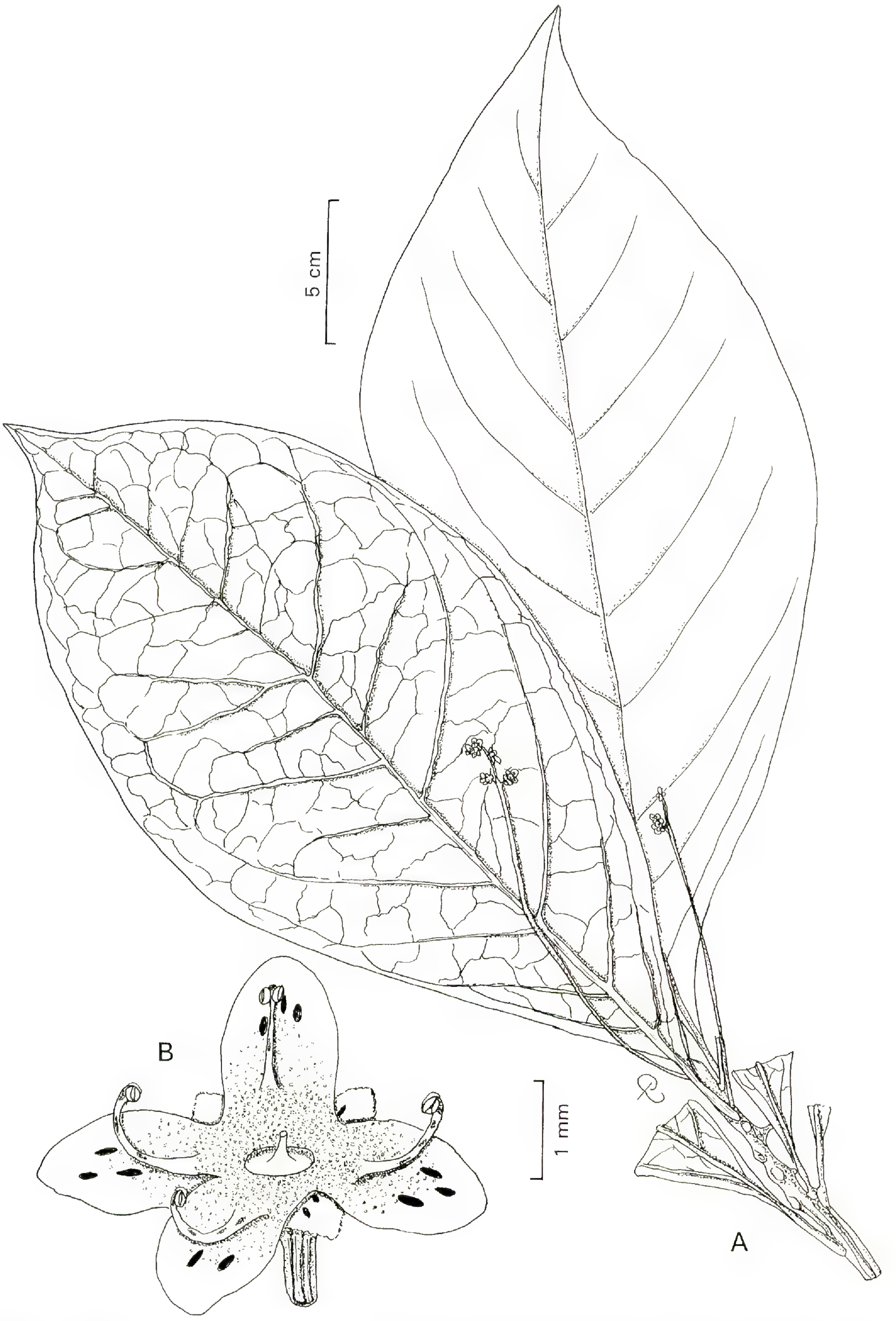

Figure 2. *Cybianthus candamoensis* Pipoly & Ricketson. —A. Flowering branch. —B. Staminate flower. Drawn from the holotype (*F. Cornejo & A. Balarezo 2947*, MO).

longitudinally dehiscent. With angulate, minutely rubiginous-furfuraceous-lepidote branchlets greater than 6 mm diam., chartaceous leaf blades, membranous corolla with lobe margins abruptly constricted basally, and bipinnate panicle, *C. candamoensis* is most closely related to the vicariant *C. rasquezii* Pipoly, but may be easily separated by the chartaceous (not coriaceous), elliptic (not oblanceolate) leaf blades with acuminate (not acute to subacuminate) apices, petioles 2–2.5 (not 2.5–3) cm long, staminate flower pedicels 1–1.2 (not 0.3–0.5) mm long, calyx unequally (not equally) divided, lobes deltate to subdeltate or widely ovate (not ovate), 0.7–1 × 0.7–1.2 (not 1.2–1.4 × 1–1.1) mm, margins irregular to somewhat erose apically (not coarsely crenate), corolla lobes 1–1.5 × 1–1.3 (not 2–2.3 × 1.7–1.8) mm with margins entire (not coarsely crenate).

Literature Cited

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Pipoly, J. 1987. A systematic revision of the genus *Cybianthus* subgenus *Grammadenia* (Myrsinaceae). Mem. New York Bot. Gard. 43: 1–76.

———. 1992. The genus *Cybianthus* subgenus *Conomorpha* (Myrsinaceae) in Guayana. Ann. Missouri Bot. Gard. 79: 908–957.

———. 1998. The genus *Cybianthus* (Myrsinaceae) in Ecuador and Peru. Sida 18(1): 1–160.

Brodiaea sierrae (Themidaceae), a New Species from the Sierra Nevada Foothills of California, U.S.A.

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Abstract. *Brodiaea sierrae* (Themidaceae), a new diploid species from the Sierra Nevada foothills of California, U.S.A., is described and illustrated. Morphologically, it is most similar to the tetraploid *B. leptandra*, from which it differs by having larger flowers, with perianth lobes up to 40 mm long (vs. 20–30 mm). The new species is also morphologically similar to *B. californica* but differs by the staminode morphology and by the lack of anther appendages. Although morphology and other data support a close relationship between the three species, they are geographically and edaphically disjunct in northern California.

Key words: *Brodiaea*, California, Themidaceae.

The genus *Brodiaea* Smith (Themidaceae) consists of approximately 14 or 15 species, almost entirely restricted to the California Floristic Province (Niehaus, 1971, 1980; Keator, 1993; Pires, 2002). *Brodiaea* has a rich taxonomic history and has been placed variously in Liliaceae, Amaryllidaceae, and Alliaceae (Hoover, 1939; Keator, 1967, 1989; Niehaus, 1971, 1980). Recent phylogenetic studies, however, place *Brodiaea* and relatives not with *Allium* L. and Alliaceae but with Hyacinthaceae and other related monocot families (Fay & Chase, 1996; Fay et al., 2000; Pires et al., 2001; Pires & Sytsma, 2002). As a result, *Brodiaea* has been reassigned to the family Themidaceae or a more inclusive Asparagaceae (Angiosperm Phylogeny Group, 2003). These studies have focused on relationships among families and genera and have not addressed relationships within *Brodiaea*, which remain poorly resolved despite having been monographed twice (Hoover, 1939; Niehaus, 1971). The genus remains a nearly untapped source for investigations on edaphic relationships, polyploidy, and hybridization.

While investigating hybridization among *Brodiaea* species, I noticed that populations of *B. californica* Lindley growing sympatrically with hybridizing species occurred in two distinct forms correlated with substrate and elevation. Upon closer examination, morphological differences between the forms became apparent. The lower elevation form includes the type of *B. californica*. The higher elevation form, which is significantly different from *B. californica* and morphologically more similar to *B. leptandra* (Greene) Baker, is described herein as a new species.

Brodiaea sierrae R. E. Preston, sp. nov. TYPE: U.S.A. California: Butte Co., 2.1 km W of Hurleton, along Forbestown Road, 19 June 2004, *R. E. Preston 2261* (holotype, DAV; isotypes, JEPS, K, MO, NY, RSA, US). Figures 1, 2.

Haec species pulchra, in California ad infimos montes Sierra Nevada septrentrionalis indigena, a subsp. *leptandra* floribus majoribus et stylis longioribus differt, et a subsp. *californica* marginibus staminodiorum integris et appendicibus antheris destitutis differt.

Corm with coarse fibrous coat, 1.5–3 dm below ground level; leaves lunate in cross-section. Scape stout, 2–8 dm tall, pedicels (0–)1.5–8.5(–16) cm long; inflorescence an umbel. Perianth 33–52.5 mm long, rose-violet to blue-violet, tube (8–)8.5–14(–15.5) mm long, lobes (24–)25–38(–40) mm long, inner (6–)6.5–11(–12) mm wide, outer (4–)4.5–7.5(–8.5) mm wide, ascending, recurved; staminode (20–)20.5–30(–31) mm long, white, linear, erect and approximate to stamens, recurved near the tip but not narrowed, margin entire, one-quarter involute, midrib noticeably thickened; stamens (12–)17–26.5(–28) mm long, filaments (7.5–)9–14.5(–15) mm long, dilated at base, anthers 10–15(–16.5) mm long, linear, apices of anther lobes erect with slight notch between; ovary ovoid, 6–10(–11) mm long, style 20–31(–34.5) mm long, ovules (12 to)17 to 36(to 42). Perianth tube in fruit translucent and splitting; fruit a loculicidal capsule; seeds black, ovoid to rhomboid, 3 mm long, margins prominently ridged. Chromosome number $n = 6$ (Niehaus, 1971, based on *Niehaus 245* [UC], *543* [UC]).

Phenology. *Brodiaea sierrae* blooms in June and July.

Distribution and ecology. *Brodiaea sierrae* is endemic to the Sierra Nevada foothills of Butte, Yuba, and Nevada Counties in California, with all but one documented population lying in a narrow elevation band between 320 and 945 m (Figure 2). The

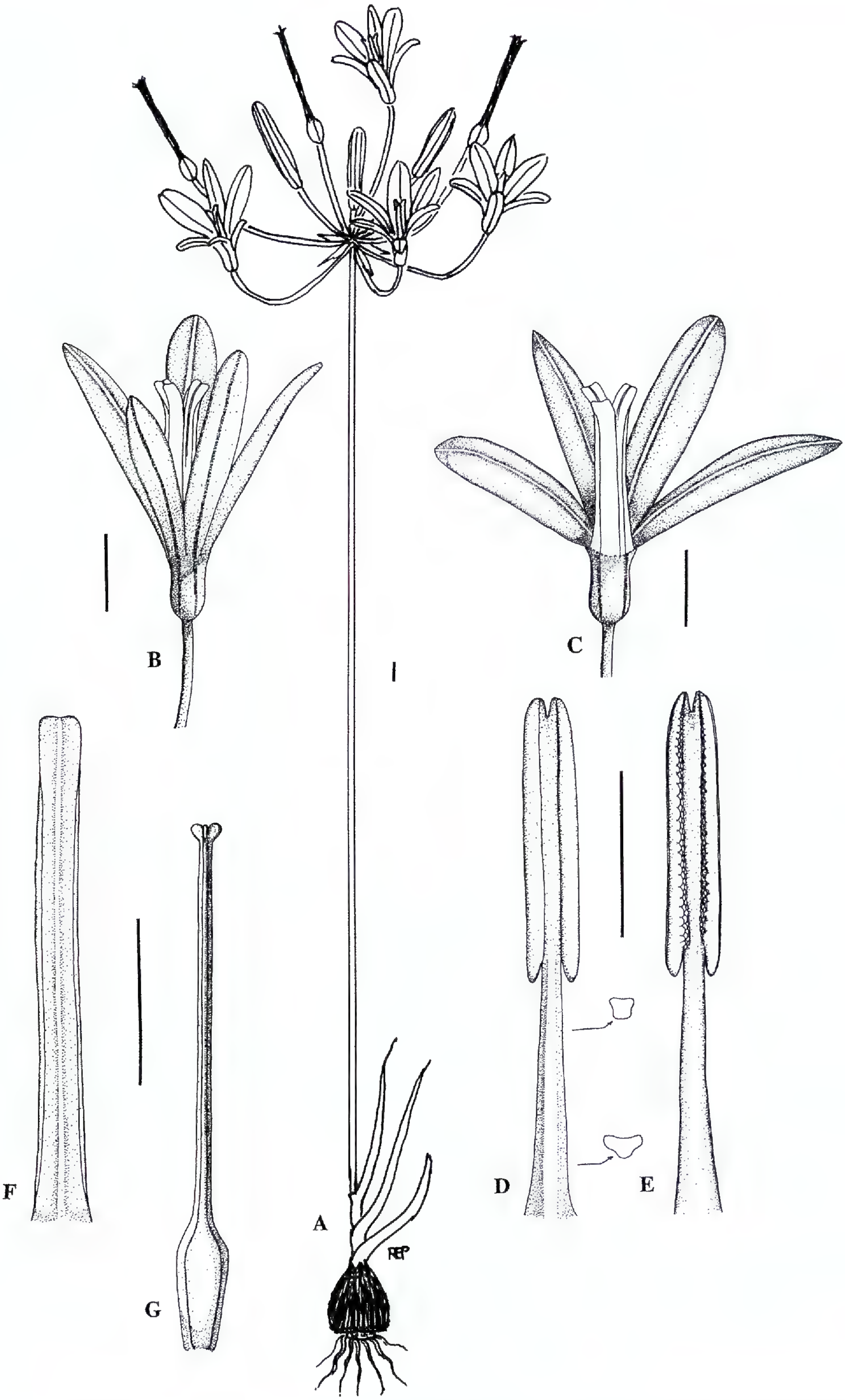

Figure 1. *Brodiaea sierrae*. —A. Habit. —B. Lateral view of flower. —C. Perianth, with 2 lobes removed to show position of staminodes. —D. Stamen (adaxial view). —E. Stamen (abaxial view). —F. Staminode. —G. Pistil. Scale bars equal 10 mm. Drawn from fresh material (*Preston 1815* [DAV]).

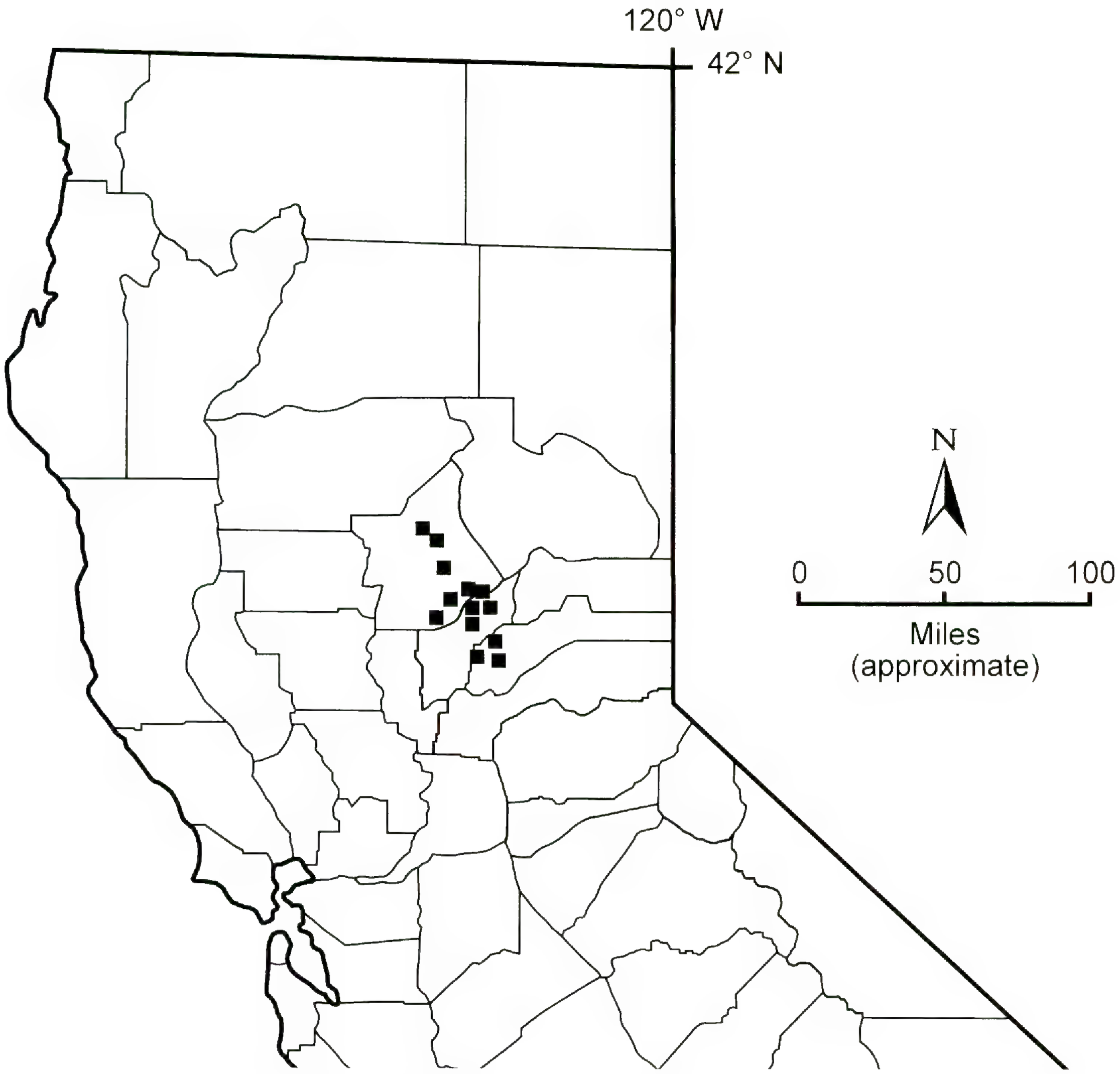

Figure 2. Distribution of *Brodiaea sierrae* (■) in California, U.S.A.

populations occur primarily on soils derived from basic and ultramafic intrusive rocks. Populations of the new species occur on serpentinite outcrops in Butte County near Magalia, Jarbo Gap, and Forbestown. Populations also occur on gabbro outcrops in Butte County near Bloomer Hill and in Nevada County near Grass Valley.

Brodiaea sierrae most commonly grows in chaparral openings but also grows in open areas in foothill woodlands. It rarely occurs in dry meadows. Associated species include *Allium jepsonii* (Traub) S. Denison & McNeal, *Arctostaphylos viscida* Parry, *Brodiaea minor* (Bentham) S. Watson, *Calocedrus decurrens* (Torrey) Florin, *Calochortus superbus* J. T. Howell, *Calycadenia truncata* DC., *Calycadenia multiglandulosa* DC., *Ceanothus cuneatus* (Hooker) Nuttall, *Ceanothus lemmonii* Parry, *Centromadia fitchii* (A. Gray) Greene, *Chlorogalum pomeridianum* (DC.) Kunth, *Dichelostemma multiflorum* (Bentham) A. Heller, *Elymus elymoides* (Rafinesque) Swezy, *Eriodictyon californicum* (Hooker & Arnott) Torrey, *Eriogonum umbellatum* Torrey, *Eriophyllum lanatum* (Pursh) J. Forbes, *Gilia capitata* Sims, *Grindelia camporum* Greene, *Heteromeles arbutifolia* (Lindley) M. Roemer, *Monardella villosa* Bentham, *Pinus sabiniana* Douglas, *Pinus ponderosa* C. Lawson, *Quercus douglasii* Hooker & Arnott, *Quercus durata* Jepson, *Quercus wislizenii* A. DC., *Polygala cornuta* Kellogg, *Sanguisorba occidentalis* Nuttall, *Streptanthus polygaloides* A. Gray, *Triteleia bridgesii* (S. Watson) Greene, and *Wyethia bolanderi* (A. Gray) W. A. Weber.

Relationships of Brodiaea sierrae. Morphologically, *B. sierrae* appears to be closely related to *B. californica* and *B. leptandra*. *Brodiaea sierrae*

is similar to *B. californica*, and previous researchers did not recognize the differences between them. *Brodiaea sierrae* is distinguished from *B. californica* by its generally larger flowers (33–53 mm long, vs. 34–44 mm in *B. californica*) and by the staminode morphology. In *B. californica*, the staminodes are recurved from the middle and narrowed at the apex, and the margins are undulate-dentate and one-half involute. In *B. sierrae*, the staminodes are uniformly wide and recurved only at the tip. The staminode margins are entire and only about one-quarter involute. In addition, *B. californica* often has a pair of appendages on the back of the stamens that are an extension of the filament. Hoover (1939: 569) stated that the presence of anther appendages was variable in *B. californica*, suggesting that this was environmentally induced by drought, as he observed appendages in plants during two drought years but did not notice appendages in plants collected during a normal rainfall year nor in plants at higher, less drought-prone elevations. I observed anther appendages at a low frequency (ca. 18% of plants) in almost all *B. californica* populations that I sampled, even during a wetter-than-normal year. However, I did not observe anther appendages in any populations of *B. sierrae*—the higher elevation population that Hoover (1939) cited (*Hoover 3620* [GH]) is actually *B. sierrae*—which weakens Hoover's hypothesis that anther appendages are environmentally induced. *Brodiaea californica* is endemic to the northern Sacramento Valley and adjacent lower Cascade Range foothills in Shasta, Tehama, and Butte Counties in California, between 45 and 335 m elevation (see Niehaus, 1971: fig. 7). It occurs on soils of volcanic origin, primarily in annual grasslands, but also in grassy openings within foothill woodlands. Most populations bloom from late April to late May, although populations at the northern end of the distribution bloom in early June (pers. obs.). Flower color in most populations of *B. californica* is pale blue-violet, although some populations have pale pink to nearly white flowers (Rowntree, 1936). Niehaus (1971) determined *B. californica* and populations of the taxon herein described as *B. sierrae* (e.g., *Niehaus 245* [UC], *543* [UC]) to be diploids ($n = 6$).

Brodiaea sierrae is most similar morphologically to *B. leptandra* (= *B. californica* subsp. *leptandra* (Greene) J. C. Pires); both species lack anther appendages and have erect staminodes with entire margins. *Brodiaea sierrae* generally has larger flowers (33–53 mm long, vs. 28–42 mm in *B. leptandra*) with wider perianth lobes (outer lobes 6.5–11 mm, vs. 4–8 mm in *B. leptandra*), and the perianth lobe midribs are red-violet (vs. green in *B. leptandra* [Doalson, 1999]). *Brodiaea leptandra* is endemic to the North Coast Ranges in Sonoma, Napa, and Lake Counties in California, between 35 and 700 m elevation (see Niehaus, 1971: fig. 7). It occurs in chaparral and openings in lower montane coniferous forest. Populations of *B. leptandra* are in bloom from about mid-June to mid-July (pers. obs.).

Brodiaea species traditionally have been recognized on the basis of discrete differences in the shape of the floral parts, and taxa delineated on the basis of size differences or the relative position of floral parts have historically been treated as varieties or subspecies (e.g., Hoover, 1939). Hoover (1939: 570) considered *B. leptandra* to be only a variety of *B. californica*, stating that there was little morphological difference between *B. leptandra* and *B. californica*, the main difference between the taxa being the presence of vegetative offsets in the former. Because Hoover's concept of *B. californica* included collections (*Elvin 46* [UC], *Elvin 50* [UC], *MacFadden 12577* [CAS], *Eastwood 565* [CAS], *Keck 1601* [DS], *Heller 8097* [DS, UC], *Eastwood 3426* [CAS], *Hoover 3620* (GH]) herein referred to *B. sierrae*, it is perhaps unsurprising that he did not distinguish the morphological differences. Niehaus (1971) employed a more modern approach, using multiple data sources, including morphology, anatomy, cytology, flavonoid chemistry, hybridization studies, geography, and ecology, to seek a better understanding of the systematics of *Brodiaea*. Although Niehaus (1971: 30) noted that the perianth segments were narrower in *B. leptandra* than in *B. californica*, he also determined *B. leptandra* to be tetraploid ($n = 12$, based on *Niehaus 679* & *Niehaus 680* [UC]), and he proposed that *B. leptandra* be recognized at species rank on the basis of morphology, cytology, and geographic distribution. Despite Niehaus's (1971) precedent using multiple sources of data for determining the ranks of *Brodiaea* taxa, later floristic treatments (Keator, 1993; Kiger et al., 2001; Pires, 2002) followed the more traditional approach and maintained *B. leptandra* at infraspecific rank (although not following it consistently, e.g., accepting Niehaus' similar proposal to recognize *Brodiaea minor* (Bentham) S. Watson and *Brodiaea purdyi* Eastwood on cytological and ecological grounds at species rank, despite considerable morphological overlap between them, rather than as varieties, as Hoover [1939] did). The degree of differentiation between *B. californica*, *B. leptandra*, and *B. sierrae*, in terms of morphology, cytology, geography, ecology, and phenology, indicates that all three taxa should be recognized at species rank.

The phylogenetic relationship between this group of taxa and other *Brodiaea* species remains poorly

resolved. *Brodiaea californica*, *B. leptandra*, and *B. sierrae* are distinguished from other brodiaeas by the large (3–5 cm long), showy flowers with long (2–3 cm), erect staminodes that are closely appressed to the anthers. Only *Brodiaea elegans* Hoover has flowers of similar size (24–47 mm long), but the staminodes in that species are short (< 15 mm) and distant from the anthers. All other brodiaeas have smaller flowers (15–30 mm long) with short staminodes (10 mm or less) that often lean toward the anthers or are not closely appressed to the anthers. Hoover (1939: 568) grouped *B. californica* (including *B. leptandra*) with *B. appendiculata* Hoover in an informal group Appendiculatae on the basis of shared floral and fruit characters, including a membranous hypanthium that splits open as the capsules mature, anther appendages, and erect staminodes with undulate-dentate margins. Niehaus (1971) proposed that *B. californica* was derived from *B. appendiculata* and, in turn, gave rise to *B. leptandra*. The recognition of *B. sierrae* throws that hypothesis into question. It seems unlikely that *B. leptandra* and *B. sierrae*, which are more similar to each other than to *B. californica*, would both be derived from *B. californica*. *Brodiaea californica* is morphologically intermediate between *B. appendiculata* and *B. sierrae*, having flowers of similar size and shape as *B. sierrae*, but having staminodes with undulate margins and anther appendages like *B. appendiculata*, and it is alternatively possible that *B. californica* was derived via introgression between the latter lineages.

Floral morphology alone appears to have limited usefulness for resolving relationships between and among *Brodiaea* species, partly because herbarium studies have relied on diagnostic floral features that are often obliterated when specimens are pressed and dried, and partly because floral character states have not been subjected to a phylogenetic analysis. Additional data are needed to elucidate the relationship among the members of Appendiculatae (Hoover, 1939) and between this group and the other brodiaeas. Niehaus (1971) recognized the difficulty in relying on morphological data for predicting phylogenies in *Brodiaea* and stressed the need for multiple data sources. Burbanck's (1941) suggestion that cytological studies might shed light on the differences among *Brodiaea* species has not yet been fully followed through on. Molecular data also show promise for resolving relationships among brodiaeas (Pires & Sytsma, 2002).

Etymology. The specific epithet refers to the species' narrow geographic distribution in the northern Sierra Nevada foothills. I suggest Sierra foothills brodiaea as the common name. *Brodiaea sierrae* is the most showy of all the *Brodiaea* taxa and has been distributed commercially as *B. californica*.

Paratypes. U.S.A. **California**: Butte Co., 1 mi. NE of Magalia, *R. E. Preston 2260* (DAV); Magalia, along The Skyway, 0.1 mi. N of Coutelenc Road, *R. E. Preston 1811* (DAV); E of Paradise & Magalia, N of Oroville & Jarbo Gap, *R. A. Schlising 4574* (CHSC); 0.3 mi. N of Jarbo Gap, *M. S. Taylor 4749* (CHSC); along Bloomer Hill Road, ca. 15 mi. NE of Oroville, *L. Ahart 4081* (CHSC); 1.2 mi. W of Hurleton, *R. Bacigalupi 3752* (JEPS); ca. 1.5 mi. S of Hurleton, *L. Ahart 8045* (CHSC); Forbestown, *R. E. Preston 1892* (DAV); 2.5 air mi. NE of Forbestown, *L. Ahart 5084* (CHSC), *8049* (CHSC, JEPS); Nevada Co., 1.5 mi. SE of Yuba/Nevada Co. line along Highway 20, *T. F. Niehaus 543* (UC); 8 mi. NW of Rough and Ready, *T. F. Niehaus 245* (UC); 1 mi. W of Grass Valley, *R. E. Preston 1815* (DAV); ca. 5 mi. SW of Grass Valley, *L. R. Heckard 3428* (JEPS); Yuba Co., Brownsville, *R. E. Preston 1894* (DAV); ca. 3 air mi. SE of Challenge, *L. Ahart 7826* (CHSC, JEPS); ca. 3/4 mi. SE of Woodleaf, *L. Ahart 8050* (CHSC); 2 mi. W of Dobbins, *M. A. Elvin 50* (UC); 0.5 mi. S of Indiana Ranch, *M. A. Elvin 46* (UC).

Key to *Brodiaea sierrae* and Related Species in California

1a. Staminode margins undulate, 1/2 inrolled, midrib not noticeably thickened; filament apex with linear appendages in all or some of the flowers.
  2a. Perianth white to pale violet, lobes ca. 3 times longer than the tube; staminodes reflexed in upper half . . . . . *B. californica*
  2b. Perianth dark violet, lobes ca. 2 times longer than the tube; staminodes erect, straight . . . . . *B. appendiculata*
1b. Staminode margins entire, 1/4 inrolled, midrib noticeably thickened; filament appendages lacking.
  3a. Perianth lobes 20–30 mm long, mid-ribs green; staminodes 16–21.5 mm long, styles 15–21 mm long . . . . . *B. leptandra*
  3b. Perianth lobes 25–38 mm long, mid-ribs red-violet; staminodes 20.5–30 mm long, styles 20–31 mm long . . . . . *B. sierrae*

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Literature Cited

Angiosperm Phylogeny Group. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. Bot. J. Linn. Soc. 141: 399–436.

Burbanck, M. P. 1941. Cytological and taxonomic studies in the genus *Brodiaea*. Bot. Gaz. 103: 247–265.

Doalson, M. C. 1999. Morphological Variation and Reproductive Biology of a Native California Geophyte, *Brodiaea californica* (Liliaceae). M.S. Thesis, California State Univ., Chico, California.

Fay, M. F. & M. W. Chase. 1996. Resurrection of Themidaceae Salisb. for the *Brodiaea* alliance, and recircumscription of the Alliaceae, Amaryllidaceae, and Agapanthoideae. Taxon 45: 441–451.

———, P. J. Rudall, S. Sullivan, K. L. Stobart, A. Y. de Bruun, F. Qamaruz-Zaman, W. P. Hong, J. Joseph, W. J. Hahn, J. G. Conran & M. W. Chase. 2000. Phylogenetic studies of Asparagales based on four plastid DNA loci. Pp. 360–371 *in* K. L. Wilson & D. A. Morrison (editors), Monocots: Systematics and Evolution. CSIRO, Collingwood, Victoria, Australia.

Hoover, R. F. 1939. A revision of the genus *Brodiaea*. Amer. Midl. Naturalist 22: 551–574.

Keator, G. 1967. Ecological and Taxonomic Studies of the Genus *Dichelostemma*. Ph.D. Dissertation, Univ. California, Berkeley, California.

———. 1989. The brodiaeas. Four Seasons 8: 4–11.

———. 1993. *Brodiaea*. Pp. 1180–1183 *in* J. C. Hickman (editor), The Jepson Manual: Higher Plants of California. Univ. California Press, Berkeley.

Kiger, R. W., F. W. Case Jr & J. C. Pires. 2001. New infraspecific names in North American *Liliales*. Taxon 50: 201.

Niehaus, T. F. 1971. A biosystematic study of the genus *Brodiaea* (Amaryllidaceae). Univ. Calif. Publ. Bot. 60: 1–67.

———. 1980. The *Brodiaea* complex. Four Seasons 6(1): 11–21.

Pires, J. C. 2002. *Brodiaea*. Pp. 321–328 *in* Flora of North America Editorial Committee (editors), Flora of North America North of Mexico, Vol. 26. Oxford Univ. Press, New York.

——— & K. J. Sytsma. 2002. A phylogenetic evaluation of a biosystematic framework: *Brodiaea* and related petaloid monocots (Themidaceae). Amer. J. Bot. 89: 1342–1359.

———, M. F. Fay, W. S. Davis, L. Hufford, J. Rova, M. W. Chase & K. J. Sytsma. 2001. Molecular and phylogenetic analyses of Themidaceae (Asparagales). Kew Bull. 56: 601–626.

Rowntree, L. 1936. Hardy Californians. The MacMillan Company, New York.

A New Species of *Manglietia* (Magnoliaceae) from China

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Abstract. *Manglietia albistaminea* Law, R. Z. Zhou & X. S. Qin, a new species from China, is described and illustrated. This species is similar to *M. fordiana* Oliver and *M. hainanensis* Dandy, from which it differs by fine short hairs on both leaf surfaces, white stamens, and white pilose carpels.

Key words: China, Magnoliaceae, *Manglietia*.

The genus *Manglietia* was described in 1823 by Blume and comprises about 31 species, of which 22 species are reported from Southwest and South China, including Guangxi, Guangdong, Yunnan, Guizhou, Hainan, and neighboring areas; the remaining 9 species are known from Myanmar, Vietnam, Laos, Thailand, Indonesia, Java, and some neighboring regions (Law, 1984, 1996, 2004; Law et al., 1995; Zeng & Law, 2004). Thus, the region of Southwest and South China may be assumed to be the center of recent distribution and origin for the genus (Law, 1984).

The Magnolia Garden at South China Botanical Garden, the Chinese Academy of Sciences, covers 12 hectares and contains 11 genera with about 130 species. It was founded in 1978 and has become one of the largest conservation centers for Magnoliaceae germplasm. From the time the garden was established, the authors, under the direction of Prof. Law Yu-hu, have introduced *Magnolia* plants from throughout China to be cultivated at the garden. The new species *Manglietia albistaminea* described in this paper was discovered in 1981 under evergreen broad-leaved forests on Mt. Jianfengling, Ledong County, Hainan Province, China, and plants were introduced to the Magnolia Garden at South China Botanical Garden, the Chinese Academy of Sciences.

The new species is assigned to *Manglietia* Blume on the basis of its young leaves folded in bud, flowers terminal, and stipules adnate to petioles. For Chinese taxa, the generic concept of *Manglietia*, sensu Law et al. (1995) is preferred over the larger generic concept for *Magnolia* as treated by Figlar and Nooteboom (2004).

Manglietia albistaminea Law, R. Z. Zhou & X. S. Qin, sp. nov. TYPE: China. Hainan Province: Ledong County, Mt. Jianfengling, under evergreen broad-leaved forests, type made from introduced plant at South China Botanical Garden, the Chinese Academy of Sciences, 10 May 2001, *R. Z. Zhou 130* (holotype, IBSC; isotype, MO). Figure 1.

Species *Manglietia fordiana* Oliver et *M. hainanensis* Dandy affinis, sed foliis oblanceolatis, utrinque pubescentibus; staminibus 80 ad 160, albis; gynoeciis triangulari ovoideis, viridi albis, stylis albis, carpellis 25–26, pubescentibus differt.

Evergreen trees to 30 m tall, 40 cm diam.; bark grayish brown, horizontally lenticellate; young twigs green, mature ones pale brown. Leaves thinly leathery, oblanceolate, 11–16 × 3–4 cm, apex long-acuminate or acute, base narrowly cuneate, margins undulate, puberulent on both surfaces; midrib impressed above and raised beneath, lateral veins 10 to 14 on each side; petioles 2–3 cm long, slightly expanded at base, stipular scars 3–3.5 mm long. Flower buds ellipsoid, pale green; flowers fragrant, tepals 9, carnose, outer 3 pale green, with longitudinal veins, 6 to 7 × ca. 3.5 cm; middle 3 white, obovate to spathulate, ca. 5.6 × ca. 4 cm; inner 3 tepals white, narrowly obovate to elliptic, ca. 5 × ca. 2.5 cm; stamens 80 to 160, white, 0.8–1 cm long, anthers 6–8 mm long, introrsely dehiscent, connective appendages triangular at the apex; gynoecia green, triangular-ovoid in shape, styles short, white, carpels 25 to 26, mid-portion with longitudinal furrow and white trichomes, each carpel with 3 to 4 ovules. Fruit aggregates unseen.

Distribution and habitat. This new species is found in evergreen broad-leaved forests on Mt. Jianfengling, Hainan Province. In the 1980s, the first authority for the new species, Law Yu-hu, and others introduced *Manglietia albistaminea* into cultivation in the Magnolia Garden at the South China Botanical Garden, the Chinese Academy of Sciences. The type of this species was collected from the cultivated location.

Phenology. The plants have been observed to flower in April–May. Fruits have not been produced in

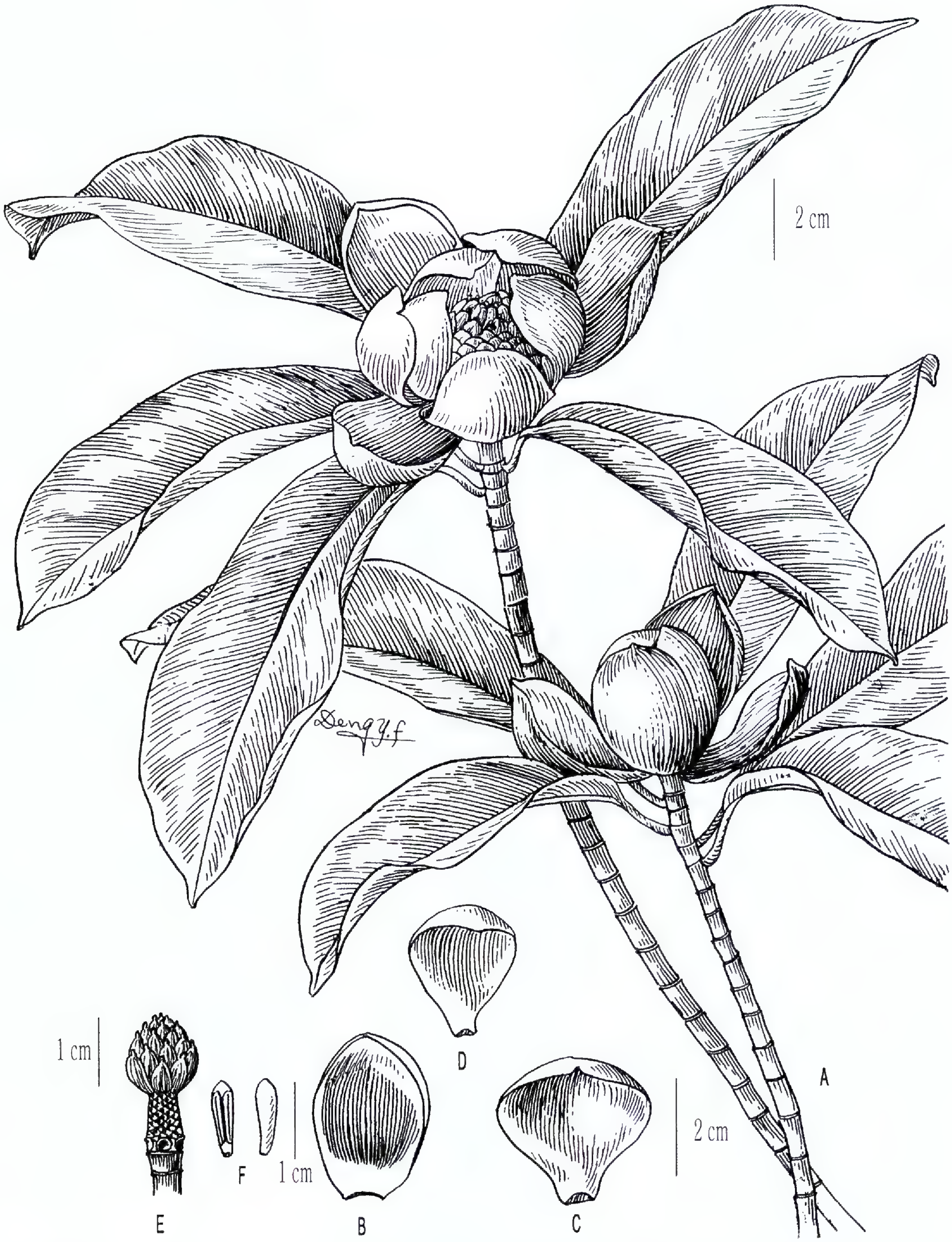

Figure 1. *Manglietia albistaminea* Law, R. Z. Zhou & X. S. Qin. —A. Two fertile branches. —B–D. Tepals. —E. Gynoecium. —F. Stamen. Drawn from the holotype, *R. Z. Zhou 130* (IBSC).

Table 1. Morphological differences between *Manglietia albistaminea*, *M. fordiana*, and *M. hainanensis*.

Characters	*M. albistaminea*	*M. fordiana*	*M. hainanensis*
Twigs	young twigs green, glabrous	young twigs rufous appressed pilose	young twigs rufous appressed pilose
Leaves (cm)	11–16 × 3–4, puberulent on both surfaces	8–17 × 2.5–5.5, rufous appressed pilose beneath	10–20 × 3–7, rufous appressed pilose beneath
Petioles (cm)	2–3	1–3	3–4.5
Stamens	white, connective appendages triangular at the apex	red, connective appendages obtuse at the apex	red, connective appendages obtuse at the apex
Gynoecium	triangular-ovoid	ovoid	ovoid
Carpels	white pilose, each carpel with 3 to 4 ovules	glabrous, each carpel with 8 to 10 ovules	glabrous, each carpel with 5 to 8 ovules

Note: The measurements for *Manglietia fordiana* and *M. hainanensis* are cited from Law (1996, 2004).

the Magnolia Garden at the South China Botanical Garden.

Taxonomic remarks. This new species differs from others in *Manglietia* by its leaves puberulent on both surfaces, its white stamens, and white pilose carpels. It is similar to *Manglietia fordiana* Oliver and *M. hainanensis* Dandy. More detailed morphological comparisons of these three species are given in Table 1.

Paratypes. CHINA. **Hainan Prov.:** Ledong County, Mt. Jianfengling, collected from introduced plant at South China Botanical Garden, the Chinese Academy of Sciences, 23 Apr. 1999, *R. Z. Zhou 9916* (IBSC); 5 May 2001, *R. Z. Zhou 0136* (IBSC).

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Literature Cited

Blume, C. (K.) L. von. 1823. *Manglietia*. Verh. Batav. Genootsch. Kunst. 9: 149.

Figlar, R. B. & H. P. Nooteboom. 2004. Notes on Magnoliaceae IV. Blumea 49: 87–100.

Law, Y. H. 1984. Preliminary study on the taxonomy of family Magnoliaceae. Acta Phytotax. Sin. 22(2): 89–109. [In Chinese.]

———. 1996. Magnoliaceae. *In:* Flora Reipublicae Popularis Sinicae 30(1): 82–106. Science Press, Beijing. [In Chinese.]

———. 2004. Magnolias of China. Beijing Sci. & Technol. Press, Beijing. [In Chinese and English.]

———, N. H. Xia & H. Q. Yang. 1995. The origin, evolution and phytogeography of Magnoliaceae. J. Trop. Subtrop. Bot. 3(4): 1–12. [In Chinese.]

Zeng, Q. W. & Y. H. Law. 2004. *Manglietia longipedunculata* (Magnoliaceae), a new species from Guangdong, China. Ann. Bot. Fenn. 41: 151–154.

El Género *Gonocalyx* (Ericaceae) en Costa Rica, con una Nueva Especie

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ABSTRACT. *Gonocalyx lilliae* (Ericaceae), a new species endemic to Costa Rica, is described and illustrated. This new species is somewhat similar to *G. costaricensis*, sharing similar shape and leaf size, racemose inflorescences, short rachis, inconspicuous bracteoles, and flowers with the hypanthium terete to subterete, with inconspicuous calyx lobes. However, *G. costaricensis* is separated by its glabrous leaves, flowers, and fruits; inconspicuous inflorescence bracts; and stamens with free filaments. A brief synopsis and a key to the species of the genus in Costa Rica are given.

RESUMEN. Se describe e ilustra *Gonocalyx lilliae* (Ericaceae), una nueva especie endémica de Costa Rica. El nuevo taxón se encuentra relacionado a *G. costaricensis*, por el tamaño y forma de sus hojas, las inflorescencias racemosas con el raquis corto, las bractéolas inconspicuas, las flores con el hipanto terete a subterete y con los lóbulos del cáliz reducidos. Sin embargo, *G. costaricensis* se diferencia por sus hojas, flores y frutos glabrescentes, las brácteas de las inflorescencias inconspicuas y los estambres con filamentos libres. Se provee una breve sinopsis y una clave para las especies del género en Costa Rica.

Key words: Costa Rica, Ericaceae, Ericales, *Gonocalyx*.

Ericaceae es una familia cosmopolita con ca. 48 géneros (Luteyn, 1991), representada en Costa Rica por 18 géneros y ca. 75 especies (Luteyn, Wilbur & Morales, en prep.). *Gonocalyx* es un género de 8 especies, distribuidas en Mesoamérica y las Islas del Caribe, con un solo taxón (*G. pulcher* Planchon & Linden) conocido en el noroeste de Colombia (Luteyn, 2001). En Costa Rica se conocen 5 especies (incluyendo la aquí se describe), distribuidas en las cordilleras entre 1100 y 2400 m. Este género se caracteriza por su hábito arbustivo, terrestre o epífito, las hojas con nervadura plinervia inconspicuamente visible, las flores con el pedicelo articulado y con 2 bractéolas generalmente diminutas, la corola tubular, los estambres de tamaño similar, las anteras dehiscentes por poros subterminales diminutos y oblicuos, con túbulos muy alargados y finalmente por sus frutos tipo baya. La exploración de la región geográfica comprendida dentro del Área de Conservación Pacífico Central (ACOPAC), ha producido el hallazgo de una especie notable de *Gonocalyx*, cuyos caracteres difieren de los taxones anteriormente registrados para el género (Luteyn, 2001). A continuación se presenta una sinopsis del género en Costa Rica, incluyendo una clave y la descripción de este nuevo taxón. La clave se ha adaptado en parte de Luteyn (2001: 439) y Luteyn, Wilbur y Morales (en prep.).

CLAVE PARA LAS ESPECIES DE *GONOCALYX* EN COSTA RICA

1. Flores solitarias o pareadas, nunca dispuestas en racimos; corola 14–26 mm de largo; anteras 11–19 mm de largo 2
1. Flores dispuestas en racimos; corola 10–17 mm de largo; anteras 7–11 mm de largo 3
2(1). Estambres con filamentos connados; hipanto 4–8 mm de largo; cáliz 3–5 mm de largo; pedicelos 1–3(–10 mm) de largo; hojas ovadas a lanceoladas, obtusas a angostamente cuneadas en la base, agudas o acuminadas en el ápice . . . . . *G. almedae* Luteyn
2. Estambres con filamentos libres; hipanto 2–3.5 mm de largo; cáliz 1–2.5 mm de largo; pedicelos 5–9(–13) mm de largo; hojas obovadas a obovado-elípticas, cuneadas o atenuadas en la base, obtusas en el ápice . . . . . *G. pterocarpus* (Donnell Smith) Luteyn
3(1). Bractéolas largas y conspicuas, 13–16 mm de largo, ubicadas en el ápice del pedicelo; hipanto conspicuamente acostillado; lóbulos del cáliz 3–4 mm de largo; raquis de la inflorescencia 1.5–7 cm de largo . . . . . *G. megabracteolatus* (Wilbur & Luteyn) Luteyn
3. Bractéolas pequeñas e inconspicuas, 0.4–2 mm de largo, ubicadas en la base del pedicelo; hipanto inconspicua y levemente acostillado o las costillas ausentes; lóbulos del cáliz 1–2 mm de largo; raquis de la inflorescencia 1–1.5 cm de largo 4
4(3). Ramitas, raquis de la inflorescencia, pedicelos, hipanto, corola y frutos glabros a glabrescentes; brácteas de la inflorescencia ca. 1 mm de largo; estambres con los filamentos libres; planta epífita, menos frecuente terrestre . . . . . *G. costaricensis* Luteyn
4. Ramitas, raquis de la inflorescencia, pedicelos, hipanto, corola y frutos con pubescencia cortamente pilosa; brácteas de la inflorescencia 5 20 mm de largo; estambres con los filamentos

connados; planta terrestre . . . . . .
. . . . . *G. lilliae* Al. Rodríguez & J. F. Morales

1. Gonocalyx almedae Luteyn, Brittonia 28: 403. 1976. TIPO: Costa Rica. Cartago: carretera #224, propiedad de la planta hidroeléctrica del ICE, 17 km detrás de la iglesia de Orosi, 13 dic. 1975, *F. Almeda & J. Utley 2673* (holotipo, DUKE; isotipos, F, GH n.v., LA n.v., NY, US).

Distribución. Costa Rica y Panamá. En el país se le encuentra en los bosques pluviales sobre la vertiente Atlántica de la Cordillera de Talamanca, entre 1000 y 1600 m.

Fenología. Flores y frutos entre febrero y abril y también en octubre.

Esta especie se reconoce de las otras presentes en Costa Rica por presentar los pedicelos generalmente muy reducidos (aunque podrían llegar hasta 10 mm), las flores solitarias o pareadas, con la corola ca. 26 mm de largo, los estambres con filamentos connados y por su hipanto conspicuamente acostillado. Vegetativamente es muy similar a *Gonocalyx costaricensis* y *G. lilliae*, pero estas especies se separan fácilmente por sus inflorescencias dispuestas en racimos.

2. Gonocalyx costaricensis Luteyn, Brittonia 28: 40. 1976. TIPO: Costa Rica. Puntarenas: Monteverde, 15 mar. *C. Palmer 146* (holotipo, NY).

Distribución. Endémica de Costa Rica. Se le encuentra en los bosques pluviales sobre ambas vertientes de la Cordillera de Tilarán, entre 1100 y 1600 m.

Fenología. Flores y frutos entre febrero y junio y también en octubre.

Gonocalyx costaricensis se distingue por la siguiente combinación de caracteres: flores dispuestas en racimos, partes vegetativas y florales glabras a glabrescentes, hipanto terete y estambres con filamentos libres. Se encuentra muy relacionada a *G. lilliae*, pero esta última especie difiere por sus partes vegetativas y florales pubescentes, así como por sus brácteas florales foliáceas y más largas (5–20 mm) y estambres con los filamentos connados.

3. Gonocalyx lilliae Al. Rodríguez & J. F. Morales, sp. nov. TIPO: Costa Rica. San José: Cantón de Acosta, Fila Bustamante, Hac. Tiquires, Fila Aguabuena, cabeceras Río Tiquires, 1600–1800 m, 2 jun. 1995, *J. F. Morales 4279* (holotipo, INB). Figura 1.

A Gonocalyx costaricensi, cui similis, ramulis, inflorescentiis, pedicellis, corollis et fructibus minute pilosis, bracteis floralibus 5–20 mm longis, et filamentis connatis differt.

Arbusto o subarbusto 30–50 cm, terrestre, erecto o colgante; ramas glabrescentes, débilmente estriadas; ramitas de un canela a canela-grisáceo, cortamente pilosas. Hojas alternas a raramente subopuestas, pecíolos 2–4 mm de largo; lámina 1.9–4 × 0.8–2 cm, ovada a angostamente ovada, el ápice agudo, la base obtusa, el margen entero y levemente revoluto, coriácea a subcoriácea, esparcidamente pilosa en ambas superficies, el envés usualmente con tricomas glandulares, esparcidos, inconspicuos y adpresos, la nervadura inconspicuamente plinervia, reticulada sobre ambas superficies. Inflorescencias axilares, terminales o subterminales, solitarias, racemosas, con 4 a 6 flores, el raquis subterete, levemente acostillado, piloso, 1–1.5 cm de largo; brácteas florales 0.5–2 cm de largo, persistentes, foliáceas, ovadas, agudas en el ápice; pedicelo subterete, estriado, 0.8–1.1 cm, piloso, articulado con el hipanto; bractéolas 0.38–0.75 mm, lineares, deciduas, localizadas cerca de la base del pedicelo. Flores con el hipanto campanulado, terete, 4–5 mm de largo, ca. 4 mm en diámetro, cortamente piloso; limbo del cáliz campanulado, suberecto, 4–5.5 mm de largo (incluyendo los lóbulos), los lóbulos 1–1.2 mm de largo, deltados, agudos en el ápice, cortamente pilosos; corola campanulada, rojiza a rojo-anaranjada, el tubo ca. 12 mm de largo y ca. 3 mm en diámetro, pilosa, los lóbulos deltados, 2–2.5 mm de largo, agudos; estambres 10, iguales, levemente más cortos que el tubo de la corola, los filamentos connados, 2–2.5 mm de largo, esparcidamente pilosos, las anteras ca. 9.5 mm de largo, la teca granular, incurvada hacia la base, ca. 2.3 mm de largo, los túbulos 2, separados, ca. 7 mm, abriendo por un poro terminal, oblicuo e introrso; ovario ínfero, el estilo filiforme, ca. 11 mm de largo, glabro, el estigma punctiforme. Baya inmadura subglobosa, pilosa, verde-rojiza.

Distribución. Endémica de Costa Rica, donde se le encuentra en bosques pluviales, robledales y potreros de la vertiente Pacífica en la Cordillera de Talamanca (Providencia de Dota) y Fila Bustamante en Acosta, entre 1600 y 2000 m.

Estado de conservación. Con base en la metodología de IUCN (2001) y a partir del conocimiento de distribución existente, *Gonocalyx lilliae* reúne los criterios fundamentales para definirla bajo la categoría denominada "En Peligro Crítico" (CR B1 ab (i, ii)); sin embargo ciertamente hay mucho desconocimiento en lo que respecta a su cuantificación poblacional. La especie se conoce únicamente de dos poblaciones aisladas, donde apenas unos poco individuos fueron observados (aunque no se hizo una

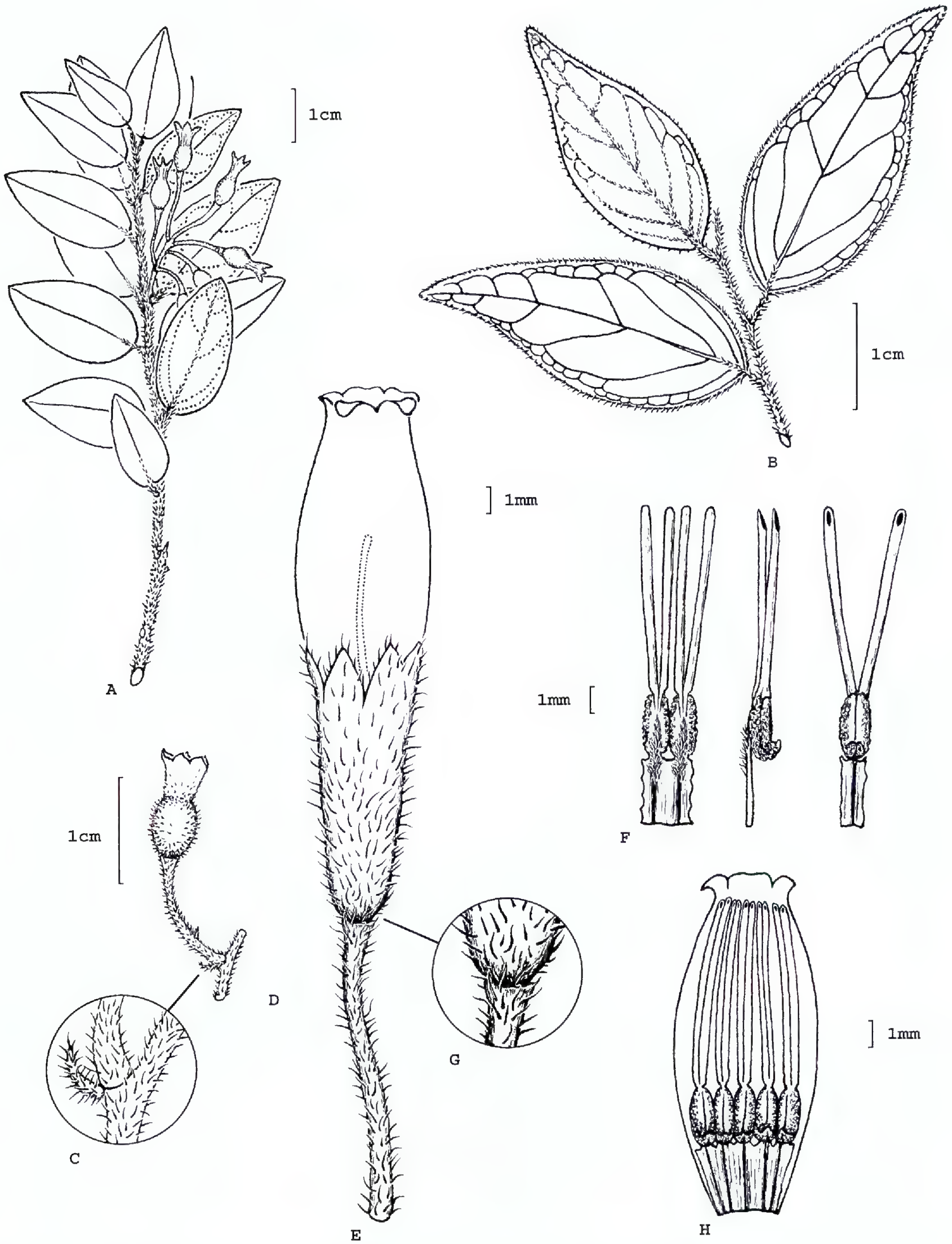

Figura 1. *Gonocalyx lilliae* Al. Rodríguez & J. F. Morales. —A. Rama con inflorescencia. —B. Detalle de la pubescencia de las hojas y ramitas. —C. Detalle de la bráctea floral. —D. Hipanto, pedicelo y bractéolas. —E. Hipanto y corola. —F. Detalle de los estambres. —G. Detalle del hipanto. —H. Corola abierta mostrando la posición de los estambres. Del holotipo, *J. F. Morales 4279* (INB).

búsqueda sistemática y cuidadosa de individuos). Se estima que el área de extensión para las dos poblaciones es menor a 50 km^2. Además, se encuentran en terrenos privados, sin protección estatal, y actualmente dedicados a actividades como la agricultura y la ganadería por lo que son áreas compuestas de bosques severamente fragmentados y en continua deforestación. *Gonocalyx lilliae* está relacionada principalmente a bosques primarios y secundarios, por tanto, la paulatina reducción de estos ecosistemas, resultado de actividades humanas, afectaría consecuentemente las reducidas poblaciones de la especie.

Fenología. Flores en abril y mayo. Frutos entre mayo y junio.

Gonocalyx lilliae es fácilmente reconocible entre las especies costarricenses, por la conspicua pubescencia de sus partes vegetativas, inflorescencias y frutos, las flores dispuestas en racimos, el hipanto terete, sin costillas longitudinales y los estambres con los filamentos connados. Se encuentra relacionada a *G. costaricensis* debido a que comparten las hojas de tamaño y forma similares, las inflorescencias racemosas, con el raquis corto y las bractéolas inconspicuas, las flores con el hipanto terete a subterete y los lóbulos del cáliz inconspicuos, pero *G. lilliae* se distingue por sus hojas, flores y frutos pubescentes, así como las brácteas de la inflorescencia conspicuas y los filamentos connados.

Esta especie es nombrada en honor a Lilly Ruiz, esposa del primer autor, por su incondicional apoyo en los estudios de la Flora Costarricense.

Paratipo. COSTA RICA. **San José:** Cantón de Dota, Providencia, 21 mar. 2001, *A. Rodríguez 7261* (INB).

4. Gonocalyx megabracteolatus (Wilbur & Luteyn) Luteyn, Brittonia 53: 437. 2001. Basónimo: *Macleania megabracteolata* Wilbur & Luteyn, Ann. Missouri Bot. Gard. 68: 163. 1981. TIPO: Panamá. Chiriquí: E de la presa en Fortuna, 22 feb. 1976, *R. Mendoza, J. Mendieta & E. Mayo 191* (holotipo, DUKE; isotipos, NY, PMA n.v.).

Distribución. Costa Rica y Panamá. En el país se le encuentra en los bosques pluviales sobre la vertiente Pacífica de la Cordillera de Talamanca, entre 1100–2100 m.

Fenología. Flores y frutos entre enero y marzo.

Esta especie es muy distintiva dentro del género por presentar bractéolas muy largas (13–16 mm de largo), flores dispuestas en racimos, hipanto conspicuamente acostillado longitudinalmente y estambres con los filamentos libres.

5. Gonocalyx pterocarpus (Donnell Smith) Luteyn, Brittonia 28: 38. 1976. Basónimo: *Themistoclesia pterocarpa* Donnell Smith, Bot. Gaz. 44: 113. 1907. *Cavendishia pterocarpa* (Donnell Smith) A. C. Smith, Contr. U.S. Natl. Herb. 28: 449–450. 1932. TIPO: Costa Rica. Heredia: Cerro Caricias, sep. 1900, *H. Pittier 14031* (holotipo, US).

Distribución. Endémica de Costa Rica. En el país se le encuentra en los bosques pluviales sobre ambas vertientes de las Cordilleras de Guanacaste y Tilarán, entre 900 y 2400 m.

Fenología. Flores y frutos en enero y julio, también en octubre y noviembre.

Gonocalyx pterocarpus se reconoce de las otras especies presentes en Costa Rica por presentar hojas con la lámina obovada a obovado-elíptica, con la base cuneada o atenuada y el ápice obtuso, flores solitarias o pareadas, con el hipanto longitudinalmente acostillado y estambres con los filamentos libres.

Agradecimientos. Queremos agradecer a Claudia Aragón por la excelente ilustración, así como a James L. Luteyn (NY) por su apoyo en la identificación previa de esta y otras ericáceas. Esta publicación fue financiada por la Asistencia Holandesa para el Desarrollo (NEDA) a través del proyecto "Desarrollo del Conocimiento de la Biodiversidad y Uso Sostenible en Costa Rica" conducido por el Instituto Nacional de Biodiversidad (INBio). Además, la investigación fue posible gracias al convenio de cooperación entre el Ministerio de Ambiente y Energía (MINAE) e INBio con el fin de completar el Inventario Nacional de Biodiversidad en Costa Rica.

Literatura Citada

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Luteyn, J. L. 1991. Key to the subfamilies and genera of neotropical Ericaceae. Nordic J. Bot. 11: 623–627.

———. 2001. Two new species and two new combinations in Mesoamerican Ericaceae. Brittonia 53: 437–446.

A New Combination in *Erythrina* (Leguminosae)

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ABSTRACT. A study of morphological characters based on a review of herbarium specimens from Yunnan Province, China, reveals that the following new combination is necessary. The previously recognized species *Erythrina yunnanensis* S. K. Lee (Leguminosae) is reduced in rank to variety as *Erythrina stricta* Roxburgh var. *yunnanensis* (S. K. Lee) R. Sa.

Key words: China, *Erythrina*, Leguminosae, new combination.

During the preparation of a forthcoming account of *Erythrina* L. (Leguminosae) for an upcoming volume of *Flora of China*, it was noticed that the description of *E. yunnanensis* S. K. Lee is incomplete and the taxonomic status of the species is in question. The species was described by Lee (1993) from specimens from Yunnan Province, China. These collections were similar to *E. stricta* Roxburgh in flower morphology, especially with respect to the spathaceous calyx. The specimens resembled *E. arborescens* Roxburgh in their larger leaflets (*E. yunnanensis* 17–24.5 × 17–24.5 cm and *E. arborescens* 8–25 × 8–25 cm vs. *E. stricta* 7–15 × 7–15 cm), as well as in the sparser distribution of prickles on branches. However, the pod character of *E. yunnanensis* was not described (Lee, 1993; Lee & Chang, 1995).

While examining *Erythrina* specimens in PE, the author fortunately found fruiting specimens of *E. yunnanensis*, which strongly resembled *E. stricta*. Both *E. stricta* and *E. yunnanensis* closely resemble each other in flower and pod morphology. The two taxa share a spathaceous calyx and similar pod sizes, with one to three seeds per pod (Table 1).

Our study of specimens indicated that the diagnostic characters of leaf size and prickle distribution were variable in both *Erythrina stricta* and *E. arborescens*, with no clear distinction between them. However, the flower and pod morphology were much more stable as reliable characters and do discriminate the two species. In contrast, it is not appropriate to retain *E. yunnanensis* at the specific rank. Its flowers and pods are not distinguishable from *E. stricta* (Table 1). With its morphological similarity for flowers and pods to *E. stricta*, *E. yunnanensis* is recognized at the varietal rank under *E. stricta*.

Erythrina stricta var. **yunnanensis** (S. K. Lee) R. Sa, comb. et stat. nov. Basionym: *Erythrina yunnanensis* H. T. Tsai & T. T. Yü ex S. K. Lee, Guihaia 13: 101. 1993. TYPE: China. Yunnan: Pingbian, on open slope, 1400 m, 29 June 1934, *H. T. Tsai 60464* (holotype, PE; isotypes, PE[2]).

Lee's 1993 description of *E. stricta* var. *yunnanensis* is emended based on the specimens *Li M. K. 0153* and *Wang C. W. 72859*.

Tree, 7 m high. Leaves pinnately ternate; terminal leaflet widely reniform, oblate, 17–24.5 × 17–24.5 cm, apex with short caudate 10–15 mm tip, base ± cuneate; lateral nerves 7 to 8 on each side and convex; petiolule 11–15 cm long, near top dark brown after dry; lateral leaflet oblate, apex briefly caudate, base subtruncate to widely cuneate; petiolule 1.6–2 cm long, dark brown when dry. Inflorescence a raceme with 3 to 4 flowers clustered on a common peduncle; flowers red; peduncle ca. 5 mm long, with dense, dark brown, short indumentum; calyx spatha-

Table 1. Diagnostic characters among *Erythrina arborescens*, *E. stricta* var. *stricta*, and *E. stricta* var. *yunnanensis* in Yunnan Province, China.

	Leaf size (length × width, cm)	Prickles	Calyx	Pod size (length × width, cm)	Number of seeds per pod
E. arborescens	8–25 × 8–25	sparse to dense	truncate	12–19 × 2.1–3.0	5 to 10
E. stricta var. *stricta*	7–15 × 7–15	dense to sparse	spathaceous	7–12 × 0.7–1.5	1 to 3
E. stricta var. *yunnanensis*	17–24.5 × 17–24.5	sparse	spathaceous	12–15 × 0.8–1.6	1 to 3

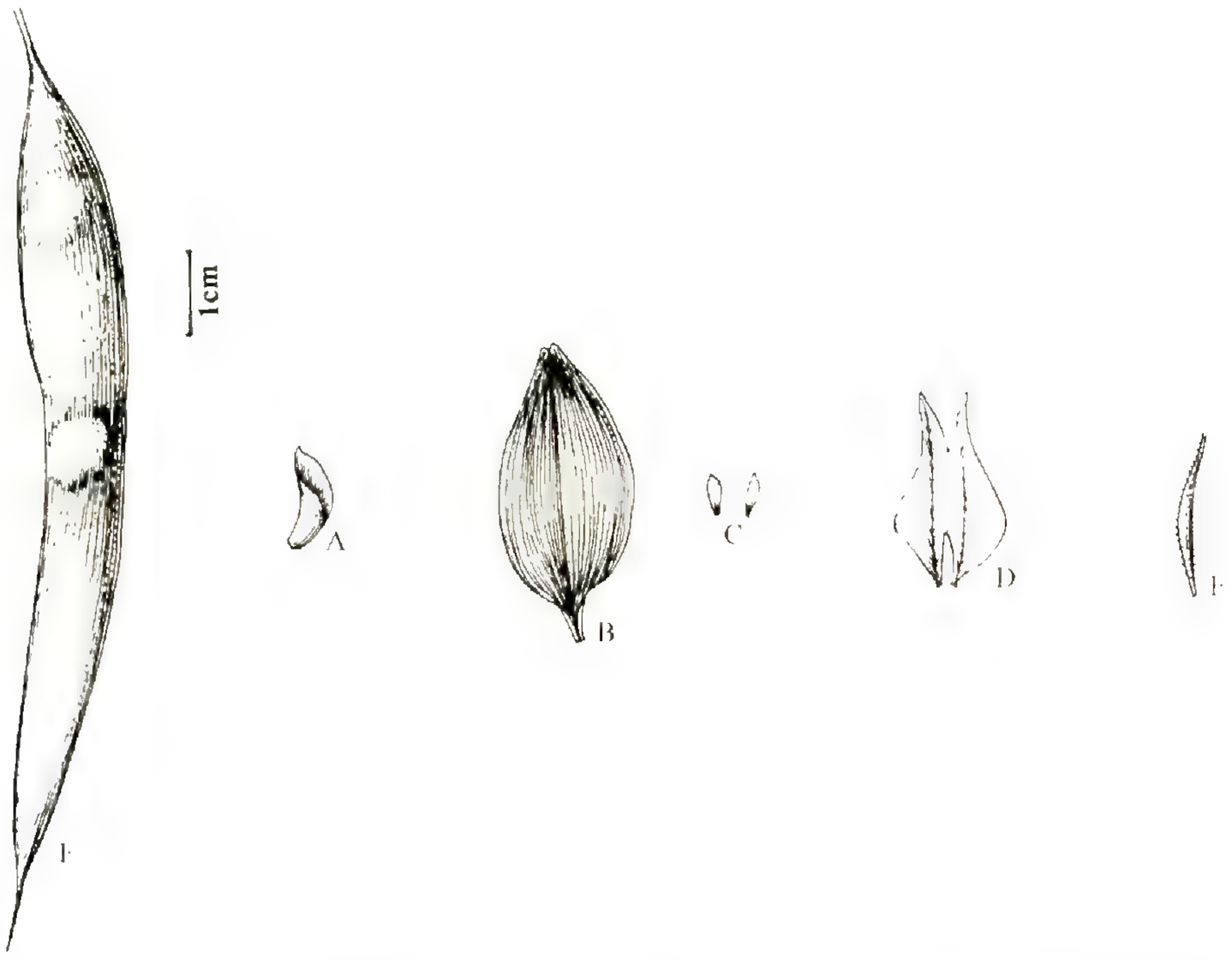

Figure 1. Flower and pod morphology of *Erythrina stricta* var. *yunnanensis*. —A. Calyx. —B. Standard. —C. Wing. —D. Keel. —E. Ovary. —F. Pod. Drawn from *Li M. K. 0153* (PE).

ceous (Fig. 1A); standard ovate-triangular (Fig. 1B), 30 × 12 mm, with stipe, wings smallest (Fig. 1C), 6 × 3 mm, keels ± obliquely triangular (Fig. 1D), ca. 12 mm long, 5 mm at widest point, stipitate; ovary pubescent, stipitate (Fig. 1E). Pod compressed, without obvious constriction between seeds (Fig. 1F); seeds dark brown, 1 to 3 per pod, reniform.

Distribution. *Erythrina stricta* var. *yunnanensis* is found in China, endemic to southern and southeastern Yunnan Province as well as eastern Xizang Province, whereas the species *E. stricta* is distributed in Guangxi, Yunnan, and Xizang Provinces of China.

Specimens examined. CHINA. **Xizang:** Medog, 18 Apr. 1983, *Cheng S. Z. & Li B. S. 04125* (PE). **Yunnan:** Chu-Hsiung, 23 Sep. 1939, *Li M. K. 0153* (PE); Gengma, Apr. 1936, *Wang C. W. 72859* (PE); Chenkang, Mar. 1936, *Wang C. W. 72130* (PE); Pingbian, 15 Apr. 1954, *Mao P. L. 03847* (PE).

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Literature Cited

Lee, S. K. 1993. A new species of *Erythrina* from Yunnan Province. Guihaia 13: 101–102.

——— & B. N. Chang. 1995. *Erythrina*. Pp. 163–169 *in* S. K. Lee (editor). Flora Reipublicae Popularis Sinicae, Vol. 41. Science Press, Beijing.

A New Species of *Begonia* Section *Platycentrum* (Begoniaceae) from Vietnam

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Abstract. A new species of *Begonia* (Begoniaceae) from Vietnam, *Begonia brevipedunculata* Y. M. Shui, is described and illustrated. It belongs to section *Platycentrum* (J. F. Klotzsch) A. DC., which is distinguished by having two persistent styles and two locules in every ovary. Its chief diagnostic characters are the dense clavate glandular pubescence on the abaxial leaf surface and the scape much shorter than the petiole. The characters distinguishing the new species from *Begonia howii* Merrill & Chun and *B. psilophylla* Irmscher are noted. In addition, a key to six similar species at the border of China and Vietnam is presented.

Key words: *Begonia*, Begoniaceae, section *Platycentrum*, Vietnam.

A survey of the literature and herbarium specimens reveals that a number of *Begonia* species co-occur in southern China and northern Vietnam. For example, *Begonia porterii* H. Léveillé & Vaniot (Gagnepain, 1921), *B. longicarpa* K. Y. Guan & D. K. Tian (Guan & Tian, 2000), *B. ceratocarpa* S. H. Huang & Y. M. Shui (*Exp. Sino.-Viet. 763* (IBSC); *Exp. Sino.-Viet. 809* (PE, IBSC)), and *B. masoniana* Irmscher (*Exp. Sino.-Viet. 917* (PE)) were first known from China and later found in Vietnam. On the other hand, *B. balansana* Gagnepain, *B. baviensis* Gagnepain, and *B. bonii* Gagnepain were first described from Vietnam, but later found in China (Ku, 1999). Thus, the study of *Begonia* collections from both counties, from the border of China into Vietnam, is necessary to establish the taxonomy of the genus.

The author noted an unusual collection (*Exp. Sino.-Viet. 671*) filed under *Begonia howii* at PE herbarium and under *B. hekouensis* S. H. Huang at IBSC herbarium. Its inflorescence is 3–6 cm long, which is much shorter than the petiole. The indumentum is a dense glandular pubescence on the abaxial leaf surface, which is very different from *B. howii*. The character of the indumentum is known to be useful for specific delimitation in the genus *Begonia* (Shui et al., 1999). Based on the indumentum and other characters, the new species is described and illustrated herein.

Begonia brevipedunculata Y. M. Shui, sp. nov. TYPE: Vietnam. Tonkin: Laocai Prov., 28 km to SE of Laocai city, Mawei village, on rocks in limestone forest, stem pinkish, leaves supra green, below red, wing of fruits red, 250–420 m, 21 Dec. 1964, *Exp. Sino.-Viet. 671* (holotype, PE; isotype, IBSC). Figure 1.

Habitu *Begoniae howii* Merrill & Chun et *B. psilophyllae* affinis, ab illa pedunculis ex rhizomate (nec ex erectis caulibus) emittentibus ala majore capsularum valde decurrentibus (nec ascendentibus), a hoc pedunculis conspicue brevioribus quam petiolis (nec longioribus) ala majore capsularum late triangulatis 0.8–1.0 cm longis 1.2–1.3 cm altis (nec oblongis 1.4–1.5 cm longis ca. 0.9 cm altis), a quibus folio subtus dense glandulifero (nec glabro) differt.

Herb 17–29 cm tall, rhizomatous and acaulescent; rhizomes ca. 2.5 cm long, ca. 1.2 cm thick, densely covered with fibrous roots, interrupted by many very short internodes and elliptic leaf scars. Leaves 2 or 3, alternate, caespitose at the upper part of rhizomes; petioles 17–24 cm long, slightly covered with appressed furfuraceous hairs; stipules unknown; blades oriented straight relative to petiole, elliptic to ovate, 15–19 × 7–10 cm, slightly and laxly incised at the margin, widely cuneate to slightly peltate at the base, acuminate at the apex, adaxially glabrous, abaxially densely covered with clavate glandular pubescence; venation palmate to pinnate, asymmetric, with 3 or 4 pairs on smaller half, 4 or 5 pairs on larger half. Flowers unknown. Inflorescences known only from fruit (4 seen), 3–6 cm long, fruiting peduncle 2–4 cm long; pedicel 9–13 mm long. Capsules pendent, glabrous, 1.4–1.6 cm tall, 1.1–1.2 cm wide, 3-winged, with 2 persistent bifurcate stigmas, without a ventral suture between the larger wing and the smaller ones, with a ventral suture between the two smaller wings; the larger wing strongly descending, triangular, 0.8–1.0 cm long, 1.2–1.3 cm high, the 2 smaller wings arching, ca. 1.5 mm long, 1.3–1.4 cm high; locules 2 in every capsule examined (4); placentas axillary, 2

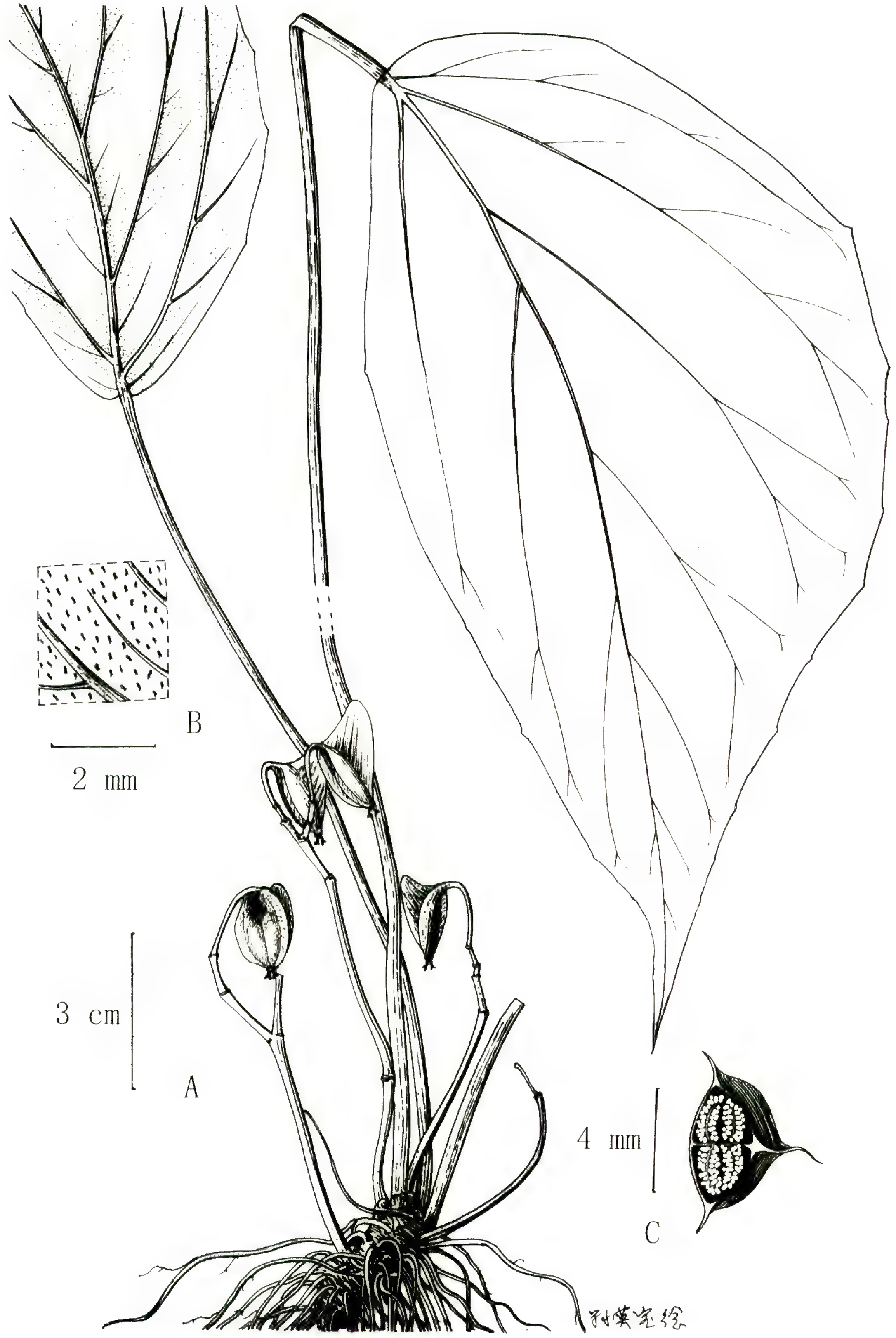

Figure 1. *Begonia breviipedunculata* Y. M. Shui, sp. nov. —A. Habit. —B. Glandular pubescence on lower leaf surface. —C. Cross section of a fruit. Drawn by Sun Ying-bao from the holotype (*Exp. Sino.-Viet. 671*, PE).

per locule, with ovules on both surfaces. Ovules numerous, elliptic in outline, foveolate.

Distribution. Vietnam (known only from the type locality).

Habitat. On rocks in limestone forest, noted from an altitude of 250–420 m.

Note. The new species is very similar to *Begonia howii*, differing in that its peduncles arise directly from the rhizomes (vs. arising from an erect stem in *B. howii*) and its fruits are pendent with larger wings strongly descending (vs. ascending ones in *B. howii*). It also resembles *Begonia psilophylla*, from which it differs in having peduncles much shorter than petioles and fruits with broadly triangular wings 0.8–1.0 cm long (vs. 1.4–1.5 cm long and a narrowly triangular shape in *B. psilophylla*). *Begonia brevipeduculata* is further distinguishable from both *B. howii* and *B. psilophylla* by having glandular pubescence on the abaxial leaf surface.

In *Begonia* sect. *Platycentrum*, the diagnostic characters are two persistent styles and lack of a ventral suture between the two locules of the capsule, suggesting two locules in a fruit (Doorenbos et al., 1998). On the basis of these characters, the new species certainly belongs to section *Platycentrum*. In *Begonia* sect. *Platycentrum*, female flowers typically have five tepals, whereas male flowers typically have four tepals. The character of the flowers seldom differs noticeably among species; however, the characters of leaf and fruit are important in distinguishing among species. Both its dense glandular pubescence on the abaxial leaf surface and its peduncle much shorter than petioles are unique characters in *Begonia* sect. *Platycentrum*. In addition, an isotype of the new species is found in IBSC besides the holotype. Therefore, even without flower materials, it is possible to differentiate *B. brevipedunculata* from other species in *Begonia* sect. *Platycentrum*.

Although the new species is based on a few unique specimens from the type locality, the high endemism on the limestone hill suggests that it may be a rare plant (Fang et al., 1995). To our knowledge, in southern China or northern Vietnam, there are five other species with cuneate or shallowly cordate leaf bases (Gagnepain, 1921; Shui et al., 2002; Smith et al., 1986), namely *B. longicarpa* (sect. *Leprosae* (T. C. Ku) Y. M. Shui), *B. oreodoxa* C. H. Hu, *B. hekouensis*, *B. psilophylla*, and *B. howii* (all of sect. *Platycentrum* (J. F. Klotzsch) A. DC.).

Key to the Six Species of *Begonia* sect. *Platycentrum* with Cuneate or Shallowly Cordate Leaf Base at the Border of China and Vietnam

1a. Leaves with trichomes on the adaxial surface.
  2a. Inflorescences emerging from the erect stem (China, Vietnam) . . . . . *B. hekouensis*
  2b. Inflorescences emerging from rhizomes, an erect stem lacking (China, Vietnam) . . . . . *B. oreodoxa*
1b. Leaves glabrous on the adaxial surface.
  3a. Fruit clavate, indehiscent (China, Vietnam) . . . . . *B. longicarpa*
  3b. Fruit turbinate, dehiscent.
    4a. Leaves glandular pubescent abaxially, peduncles arising directly from rhizomes (Vietnam only) . . . . . *B. brevipedunculata*
    4b. Leaves glabrous abaxially, peduncles from erect stems.
      5a. Leaves widely cuneate, oblique (Hainan, China, only) . . . . . *B. howii*
      5b. Leaves slightly cordate or rotundate, more or less symmetric (China, Vietnam) . . . . . *B. psilophylla*

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Literature Cited

Doorenbos, J., M. S. M. Sosef & J. J. F. E. de Wilde. 1998. Pp. 155–159 *in* The Sections of *Begonia*. Wageningen Agricultural University, The Netherlands.

Fang, R. Z., P. Y. Bai, G. B. Huang & Y. G. Wei. 1995. A floristic study on the seed plants from tropics and subtropics of Dian-Qian-Gui. Acta Bot. Yunnan. Suppl. 7: 111–150.

Gagnepain, F. 1921. Begoniaceae. Pp. 1095–1120 *in* M. H. Lecomte (editor), Flore Générale de l'Indochine, ed. 2.

Guan, K. Y. & D. K. Tian. 2000. Three new species of *Begonia* from Yunnan. Acta Bot. Yunnan. 22: 129–134.

Ku, T. C. 1999. Begoniaceae. *In*: S. S. Chien & W. Y. Chun (editors), Flora Reipublicae Popularis Sinicae 52: 126–269. Science Press, Beijing.

Shui, Y. M., Q. R. Li & S. H. Huang. 1999. Observation of leaf epidermis and its hairs of *Begonia* from Yunnan. Acta Bot. Yunnan. 21: 309–314.

———, C. I Peng & C. Y. Wu. 2002. Synopsis of the Chinese species of *Begonia* (Begoniaceae), with a reappraisal of sectional delimitation. Bot. Bull. Acad. Sin. 43: 313–327.

Smith, L. B., D. C. Wasshausen, J. Golding & C. E. Karegeannes. 1986. Begoniaceae. Part I: Illustrated Key: Part II: Annotated Species List. Smithsonian Contr. Bot. 60: 1–584.

A New Species of *Croton* (Euphorbiaceae) from Ecuador

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Abstract. A new species of *Croton* (Euphorbiaceae) from the western slopes of the Andes in Ecuador is described. *Croton floccosus* is a medium-sized tree that is common along streambeds and disturbed sites in the Pichincha and Imbabura provinces of Ecuador. This species appears most closely related to the Colombian species *C. polycarpus* Bentham, *C. mutisianus* Kunth, and *C. magdalenensis* Müller Argoviensis in section *Cyclostigma* Grisebach, but differs in having staminate flowers with gland-tipped petals, 15 or 16 stamens with pubescent filaments, and long pedicels (7–16 mm); small fruits (6.4–7.7 mm diameter); and entire to dentate stipule margins. Because of its apparent affinity with these Colombian species, I place *Croton floccosus* in section *Cyclostigma*.

Resumen. Se describe una nueva especie de *Croton* (Euphorbiaceae) de las vertientes occidentales de los Andes en Ecuador. *Croton floccosus* es un árbol mediano que es común al lado de arroyos y sitios alterados en las provincias de Pichincha e Imbabura en Ecuador. Esta especie parece estar más cercanamente relacionada con las especies colombianas *C. polycarpus* Bentham, *C. mutisianus* Kunth y *C. magdalenensis* Müller Argoviensis en la sección *Cyclostigma* Grisebach, pero difiere por tener las flores estaminadas con pétalos glandulares en el ápice, 5 ó 16 estambres con los filamentos pubescentes y los pedicelos largos (7–16 mm); frutos pequeños (6.4–7.7 mm); y los márgenes de las estípulas enteros o dentados. Debido a su afinidad evidente con estas especies colombianas, incluyo a *Croton floccosus* en la sección *Cyclostigma*.

Key words: *Croton floccosus*, Ecuador, Euphorbiaceae, section *Cyclostigma*.

Croton is a genus in the Euphorbiaceae containing over 1200 species of herbs, shrubs, and trees that is particularly diverse in South America (Govaerts et al., 2000). *Croton* sect. *Cyclostigma* Grisebach (sensu Webster, 1993) contains roughly 50 species that are distributed in tropical and subtropical regions of Mexico, Central America, and South America. Section *Cyclostigma* is commonly referred to as the dragon's blood (sangre de drago) group due to the presence of red latex in many of the species, which is used by indigenous peoples and colonists for a wide range of ailments. During a revision of *Croton* sect. *Cyclostigma* in Ecuador, a number of collections from areas west and north of Quito were determined to represent a species not formally described.

Croton floccosus B. A. Smith, sp. nov. TYPE: Ecuador. Prov. Pichincha: Cantón Quito, 10 km W of Nanegalito on rd. to Puerto Quito, 78 45′W, 00 02′S, 1820 m, July 1994, *B. A. Smith 224* (holotype, DAV; isotypes, MO, NY, QCNE, WIS). Figure 1.

Haec species ex affinitate *C. polycarpi*, foliis floccosis lamina basi glandulosa, stipulis subintegris, staminibus 15 ad 16, petalorum apice glanduloso distinguenda.

Tree up to 25 m high, trunk slender with a spreading crown; bark white; latex red or occasionally light orange in young branches; indumentum on young branches golden brown with dense covering of dendritic and rosulate trichomes. Leaf blades coriaceous, dark green, adaxial surface of young leaves densely covered with golden-yellow floccose indumentum of dendritic and rosulate trichomes, becoming glabrous to subglabrous on mature leaves, abaxial surface with dense white indumentum; leaves ovate or occasionally almost elliptical, 7–23 × 3.5–12 cm, length:width ratio 1.3–2.7:1, tip acuminate, margin entire or very seldom slightly denticulate or crenulate, margin with small sessile glands, base rounded, sometimes truncate or weakly cordate; venation ± actinodromous with 2 basal secondary veins at lower angles of origin than the other 7 to 14 secondary vein pairs, one or more intersecondary veins usually present, tertiary veins percurrent, weakly sinuous or retroflexed, occasionally forked; adaxial surface with main vein raised, rarely secondary veins raised, abaxial surface with primary, secondary, and tertiary veins raised; foliar glands 2 to 6 and acropetiolar, gland number varying on individuals, usually with one pair of glands positioned on the abaxial surface of

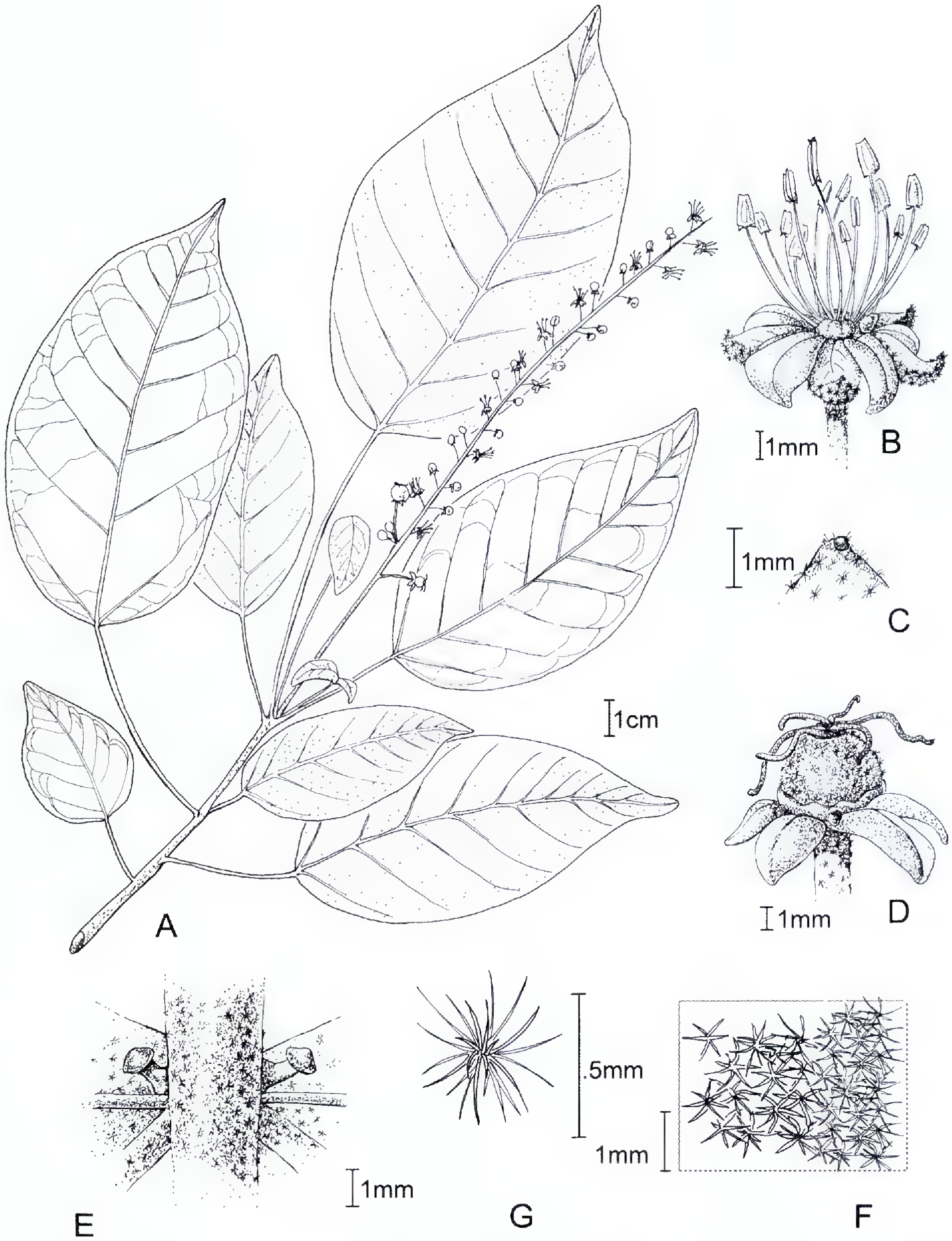

Figure 1. *Croton floccosus* B. A. Smith. —A. Branch with female and male flowers. —B. Male flower. —C. Tip of petal from male flower showing terminal gland and multiradiate trichomes. —D. Female flower. —E. Base of leaf showing paired stipitate abaxial glands and dense indumentum (petiole extends upward). —F. Abaxial leaf surface with dense indumentum of rosulate and multiradiate trichomes. —G. Detail of rosulate trichome from abaxial leaf surface (*B. A. Smith 224*, DAV).

leaf and one pair of glands on the adaxial surface of the petiole near base of blade, glands sessile to stipitate, less than 2 mm long and terminally convex; petioles 2.5–15 cm long with dense indumentum of dendritic or rosulate trichomes, petiole:leaf length ratio 0.25–1:1; stipules weakly persistent, lanceolate to almost linear, 4–7(–11) × 0.5–1.1 mm, margin entire to dentate, glandular, with indumentum of rosulate trichomes. Inflorescences terminal, erect, 25–30 cm long, cymules with 1 to 3 flowers, rachis angular, golden brown with dense covering of dendritic trichomes, lower cymules bisexual with only 2 or 3 staminate flowers and lowest few cymules sometimes strictly pistillate; pistillate bracts widely triangular ca. 1 mm long and 1 mm wide; staminate bracts setaceous, less than 1 mm long. Staminate flowers with pedicels 7–16 mm; sepals valvate, ovate, and acute, lobe of sepal 2.5–4.1 × 1.5–2.1 mm,

Table 1. Character states described in original species descriptions. Descriptions in parentheses are from the author's observations of type specimens (! = confirmed by author).

Character	*Croton polycarpus*	*Croton magdalenensis*	*Croton mutisianus*
Style	multifid (bifid with short laciniate tips)	bifid (!)	bifid (!)
Stamen number	ca. 20(17)	ca. 25	14 to 15 (could not be confirmed)
Stipule margin	pinnatifid (dentate to deeply pinnate)	denticulate (to subpinnate)	no mention of margin (could not be determined)

adaxial surface of sepal glabrous, abaxial surface with dense indumentum of rosulate and/or multiradiate trichomes, edges lanate; petals ovate to elliptic, cream-colored, 3–4.1 × 1.2–2.2 mm, tip of petal with tiny terminal gland, adaxial surface of petal glabrous, abaxial surface with sparse to dense covering of multiradiate trichomes with long rays, edges lanate; receptacle with a few trichomes to densely pilose; nectary lobes with emarginate tips; stamens 15 or 16(to 18); filaments 3.9–4.7 mm long with a few simple trichomes; anthers ca. 1 mm long. Pistillate flowers with pedicels 11–24 mm; sepals oblong to slightly obovate, valvate, tip acute, sepal lobes 4.1–4.7 × 1.8–2.7 mm, adaxial surface of sepals with a few multiradiate trichomes, abaxial surface densely covered with rosulate trichomes; malformed petals generally present though sometimes reduced to a stalked or sessile gland (some specimens with petals, stalked glands, and sessile glands on different female flowers of the same plant); ovary with rosulate or multiradiate trichomes, these may be subporrect or porrect; styles once bifid, forking near the base, tips of styles flattened, base of styles with multiradiate hairs. Fruits globose, brown, ca. 6–7.5 mm high, 6.4–7.7 mm wide; columella 4.9–7.2 mm long; seeds brown with rugose surface, 4–5.1(–7) × 3.2–5.0 mm; caruncle 0.9–1.2 × 1.3–1.9 mm.

Taxonomy and variation. *Croton floccosus* appears to be closely related to the Colombian species *Croton magdalenensis* Müller Argoviensis, *C. polycarpus* Bentham, and *C. mutisianus* Kunth. It is difficult to differentiate these Colombian species from one another, and it was Croizat (1944) who first suggested that these species may better be treated as varieties of *C. polycarpus*. A paucity of field collections has made it difficult to assess the relationships among these three species. Based on the descriptions of *C. polycarpus*, *C. magdalenensis*, and *C. mutisianus* (Bentham, 1839; Müller, 1866; von Humboldt et al., 1817, respectively), they appear to be separated based primarily on differences in style branching, stamen number, and stipule morphology. A review of type specimens for *C. polycarpus*, *C. magdalenensis*, and *C. mutisianus* (*Hartweg 1373* (K); *Triana 3631* (W); *Mutis s.n.* (US), respectively), reveals that these characters may not differ as much as previously indicated (Table 1). Style branching is very similar among the three species, but the essentially bifid styles of *C. polycarpus* have short laciniate tips. The stamen number of *C. mutisianus* (14 or 15) is significantly less than the (17 to)20 to 25 found in the other two species, but I could not confirm this number on the type specimen. Of the 44 specimens reviewed from Colombia, which fit into this species complex, I did not find any collections with less than 17 stamens. The stipules are quite variable, ranging from denticulate to pinnatifid even on an individual plant. Additional collections may support Croizat's (1944) idea of subsuming all three species into *C. polycarpus*. *Croton floccosus* has a number of staminate flower characters that distinguishes it from the *C. polycarpus* species complex. These differences include gland-tipped petals, a longer pedicel, and fewer stamens (Table 2). *Croton coriaceus* Kunth, which is also in section *Cyclostigma*, is sympatric with *C. floccosus* and has floccose indumentum on young leaves, but *C. coriaceus*, unlike *C. floccosus*, has fasciculate hairs on mature leaves and clear to translucent yellow latex.

Distribution and ecology. *Croton flocossus* is confined to Pichincha and Imbabura provinces in Ecuador between the elevations of (600–)1150 and 2400(–3300) m. It has not been collected on the well-traveled Quevedo to Latacunga road in Cotopaxi province, but it would not be surprising to find populations of this species in the northern portion of Cotopaxi province, where a lack of roads has prevented adequate collecting. Trees are common in disturbed areas along roadsides, streams, and in pastures. The abundance of *C. floccosus* in pastures may be due to planting by colonists who use the latex of this species in similar ways to *C. lechleri* Müller Argoviensis. See Jones (2003) for a review of uses for *C. lechleri*.

Phenology. Flowering February to November; fruiting February to November.

Paratypes. ECUADOR. **Imbabura:** cantón Cotacachi, carr. Apuela–Cotacachi, *W. Palacios, C. Iguago 4840* (QCNE); carr. Cotocachi a Apuela, *D. Rubio & C. Quelal*

Table 2. Comparison of *Croton floccosus* with *C. polycarpus* species complex. *Croton polycarpus* species complex includes collections identified as *C. magdalenensis*, *C. polycarpus*, and *C. mutisianus*.

Character	*C. floccosus* (Ecuador)	*C. polycarpus* complex (Colombia)
♂ flower: terminal gland on petal	present	absent
♂ flower: length of pedicel	7–16 mm	2.5–7 mm
Stamen number	15 to 16(to 18)	(17 to)22 to 25
Trichomes on filaments	simple hairs present	glabrous
Fruit diameter (mm)	6.4–7.7	9–13
Stipule margin	entire to dentate	denticulate to pinnately lobed

587 (QCNE); parroquia Apuela, *G.Tipaz & C. Aulestja 1642* (DAV, QCNE). **Pichincha:** cantón Santo Domingo, Old Santo Domingo rd. 4.5 km W of Chiriboga, *B. Smith & G. Webster 101* (DAV, QCNE); cantón Quito, Maquipucuna reserve, 200 m S of parking area for res. station, next to Umachaca river, *B. Smith & M. Geary 306* (DAV, QCNE); 11.2 km E of Nanegalito on rd. to Calacali, *B. Smith & M. Geary 307* (DAV, QCNE); rd. from Quito to Santo Domingo next to rd., *B. A. Smith 106* (DAV, QCNE); rd. from Quito-Nono-Nanagalito, 31.4 km from turnoff onto rd., *B. A. Smith 201* (DAV, QCNE); 4 km W of turnoff onto Calicali-Nanegalito rd. coming from Nono, *B. A. Smith 221* (DAV, QCNE); 22.5 km W of Nanegalito on rd. to Puerto Quito, *B. A. Smith 223, 224, 225* (DAV, QCNE); 21.3 km W of Nanegalito on rd. to Puerto Quito, *B. A. Smith 226* (DAV, QCNE); 26.3 km W. of Nanegalito on rd. to Puerto Quito, *B. A. Smith 227* (DAV, QCNE); Maquipucuna, *G. Tipaz & C. Quelal 188* (QCNE); Maquipuquna, parcela permanente de 1 hectárea, *C. Quelal & G. Tipaz 135* (DAV, QCNE); 5.5 km by rd. W of Tandayapa, *G. Webster, M. Rios & B. Castro 28376* (DAV, QCNE); Carr. Calacali–Nanegalito, *E. Gudiño, D. Rubio, G. Tipaz & C. Quelal 1412* (QCNE); Carr. Nono–Nanegalito, *H. Balslev & B. Boom 2480* (NY, QCNE); Maquipuquna, *G. L. Webster 32816* (DAV); Santo Domingo, Parroquia Tandapi, *C. Cerón 6909* (MO, QCNE); km 65, carr. vieja vía Chiriboga Quito-Santo Domingo, *C. Dodson, A. Gentry, W. Palacios & J. Zaruma 14370* (DAV, MO, QCNE); km 96–94 old road to Santo Domingo, *C. Dodson & A. Gentry 9686* (DAV, MO, QCNE); Rt. de Aloag a Santo Domingo, *Ch. Huttel 1065* (QCNE); Road La Union del Toachi–San Francisco de las Pampas, km 3, *G. Harling & L. Anderson 23141* (GB); Santo Domingo–Tandapi, km 14, *G. Tipaz & J. Zuleta 912* (DAV); along new rd. Nanegal–Mindo, *H. van der Werff, B. Gray & P. Fuentes 13379* (QCNE); Río Guajalito, *J. Jaramillo & V. Zak 7839* (DAV); reserva flor.-ecol. Río Guajalito, km 59, carr. antigua Quito–Sto. Domingo, 3.5 km al NE de la carr., *J. Jaramillo & V. Zak 7848* (DAV); *V. Zak 5513, 5514* (DAV, MO, QCNE); carr. Quito–Lloa–Mindo, *V. Zak & J. Jaramillo 2136* (DAV); carr. Quito–Nono–Taqndayapa–Pto. Quito, entre Nonoy Tandayapa, *V. Zak & J. Jaramillo 3070* (DAV, MO).

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Literature Cited

Bentham, G. 1839. Plantas Hartwegianas imprimis Mexicanas adjectis nonnullis Grahamianis enumerat novasque describit. Gulielmus Pamplin, London.

Croizat, L. 1944. Euphorbiaceae novae vel criticae Colombianae, IV. Caldasia 3: 7–19.

Govaerts, R., D. G. Frodin & A. Radcliffe-Smith. 2000. World Checklist and Bibliography of Euphorbiaceae. Royal Botanic Gardens, Kew.

Jones, K. 2003. Review of sangre de drago (*Croton lechleri*)—A South American tree sap in the treatment of diarrhea, inflammation, insect bites, viral infections, and wounds: Traditional uses to clinical research. J. Altern. Complem. Med. 9(6): 877–896.

Müller, J. 1866. Euphorbiaceae. Pp. 189–1261 *in* A. P. de Candolle (editor), Prodromus Systematis Naturalis Regni Vegetabilis, vol. 15, part 2. Victor Masson, Paris.

Von Humboldt, F. W. H., A. J. A. Bonpland & C. S. Kunth. 1817. Nova Genera et Species Plantarum 2.

Webster, G. L. 1993. A provisional synopsis of the sections of the genus *Croton* (Euphorbiaceae). Taxon 42: 793–823.

Memecylon batekeanum, a New Species from Southeastern Gabon, and a Note on the Circumscription of *Memecylon* Sect. *Mouririoidea* (Melastomataceae)

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Abstract. Described and illustrated is *Memecylon batekeanum* R. D. Stone & G. M. Walters from the buffer zone of the Batéké Plateaux National Park in southeastern Gabon. This new species is closely related to *M. amshoffiae* Jacques-Félix of Cameroon, but is distinguished by its shrubby habit, quadrangular-alate young branchlets, fewer-flowered inflorescences, and calyptrate calyx. A provisional IUCN status of Vulnerable is assigned. *Memecylon amshoffiae* was treated earlier in section *Mouririoidea* Jacques-Félix, but this is contraindicated by evidence from ovary and anther morphology and by recent molecular phylogenetic analyses. Together, *M. amshoffiae* and *M. batekeanum* are provisionally placed next to *M. diluviorum* Exell in section *Polyanthema* Engler.

Résumé. Dans ce travail est décrit et illustré *Memecylon batekeanum* R. D. Stone & G. M. Walters du zone tampon du Parc National des Plateaux Batéké du Sud-est Gabon. Cette nouvelle espèce se rapproche de l'espèce Camerounaise *M. amshoffiae* Jacques-Félix, mais s'en distingue par sa forme d'arbrisseau, ses jeunes rameaux 4-angulaires-ailés, ses cymes peu fleuries, et son calice calyptriforme. Un statut préliminaire de Vulnérable est effectué selon les critères des Listes Rouges de l'UICN. Le traitement antérieure de *M. amshoffiae* dans la sect. *Mouririoidea* Jacques-Félix est contrindiqué par des preuves obtenues à partir des caractères morphologiques des ovaires et des anthères, ainsi que par des analyses moléculaires phylogénétiques. *Memecylon amshoffiae* et *M. batekeanum* sont provisoirement placés tous les deux près de *M. diluviorum* Exell dans la sect. *Polyanthema* Engler.

Key words: Gabon, Melastomataceae, *Memecylon*, riverine forest, plant conservation.

Regarding the widespread paleotropical genus *Memecylon* L., our knowledge of its diversity in Africa and Madagascar has been greatly advanced by the work of H. Jacques-Félix. His detailed morphological and anatomical studies, along with those of K. Bremer, have led to the recognition of the segregate genera *Spathandra* Guillemin & Perrottet, *Lijndenia* Zollinger & Moritzi, and *Warneckea* Gilg (Jacques-Félix, 1978b; Bremer, 1982)—concepts that have received additional support from molecular phylogenetic analyses (Stone, 2006).

Within *Memecylon* s. str., Jacques-Félix (1978a, 1979) accounted for the western and central African taxa by recognizing section *Polyanthema* Engler (ca. 16 species) and by proposing two new sections, *Afzeliana* Jacques-Félix (ca. 18 species) and *Mouririoidea* Jacques-Félix (5 species). The first two groups have unilocular ovaries and are diagnosed by the shape of the fruit (globose in sect. *Polyanthema* vs. ellipsoid to oblong in sect. *Afzeliana*). Section *Mouririoidea* is characterized by a 4-loculed ovary and conspicuously 4-lobed calyx; it is an especially distinctive group in which Jacques-Félix (1978a, 1979, 1983a, b) placed *M. lateriflorum* (G. Don)

Figure 1. Flower of *Memecylon amshoffiae* Jacques-Félix (ca. 10 times natural size) showing the enlarged and elongated anther connectives, each bearing a dorsal gland. The four separate petals are recurved at anthesis and the bases overlap one another, the corolla thus falsely appearing sympetalous. Photograph by RDS on left bank of Nyong River ca. 10 km southwest of Eséka, South province, Cameroon, corresponding to the specimen *Stone & Ghogue 2529* (CAS, YA).

Bremekamp (the type species of the section) along with *M. amshoffiae* Jacques-Félix, *M. mouririoides* Jacques-Félix, *M. occultum* Jacques-Félix, and *M. ramosum* Jacques-Félix.

Recent phylogenetic analyses of nuclear genomic sequences have demonstrated that *Memecylon amshoffiae*, a riparian forest tree from Cameroon's South province, is quite divergent from *M. lateriflorum* and other members of section *Mouririoidea* (Stone, 2004 & unpublished data). Furthermore, although Jacques-Félix (1979) described the ovary of *M. amshoffiae* as 4-loculed, this is clearly incorrect: the ovary is unilocular, based on new dissections by the first author of flower buds from an isotype specimen (*Leeuwenberg 5142*, UC) and another recent collection from the type region (*Stone & Ghogue 2529*, CAS). *Memecylon amshoffiae* also has elongated anther connectives, such that the gland is positioned on the dorsal surface (Fig. 1), while in *M. lateriflorum* and other members of section *Mouririoidea* the connectives are scarcely or not prolonged, the gland thus positioned laterally on the face opposite the anther sacs (Jacques-Félix, 1979, 1983a). These morphological and molecular results provide strong indication that *M. amshoffiae* must be excluded from the circumscription of section *Mouririoidea*. The current infrageneric placement of *M. amshoffiae* is discussed following the description of a new, closely related species from southeastern Gabon.

Memecylon batekeanum R. D. Stone & G. M. Walters, sp. nov. TYPE: Gabon. Haut Ogooué: buffer zone of Batéké Plateaux National Park, embarquiadère to Projet Protection des Gorilles, 1 58′17″S, 14 00′34″E, 400 m, 25 Nov. 2001, *G. Walters, A. Bradley, G. Nang-Essouma & A. Mbaniboua 967* (holotype, MO; isotypes, CAS, LBV, WAG). Figure 2.

Haec species *M. amshoffiae* Jacques-Félix affinis, sed ab eo habitu fruticoso, ramulis juvenibus quadrangulari-alatis, inflorescentia breviore pauciflora semel ramificante atque calyce calyptriformi differt.

Evergreen shrub less than 1 m high; young branchlets quadrangular and narrowly alate (this condition evidently not persisting below the first

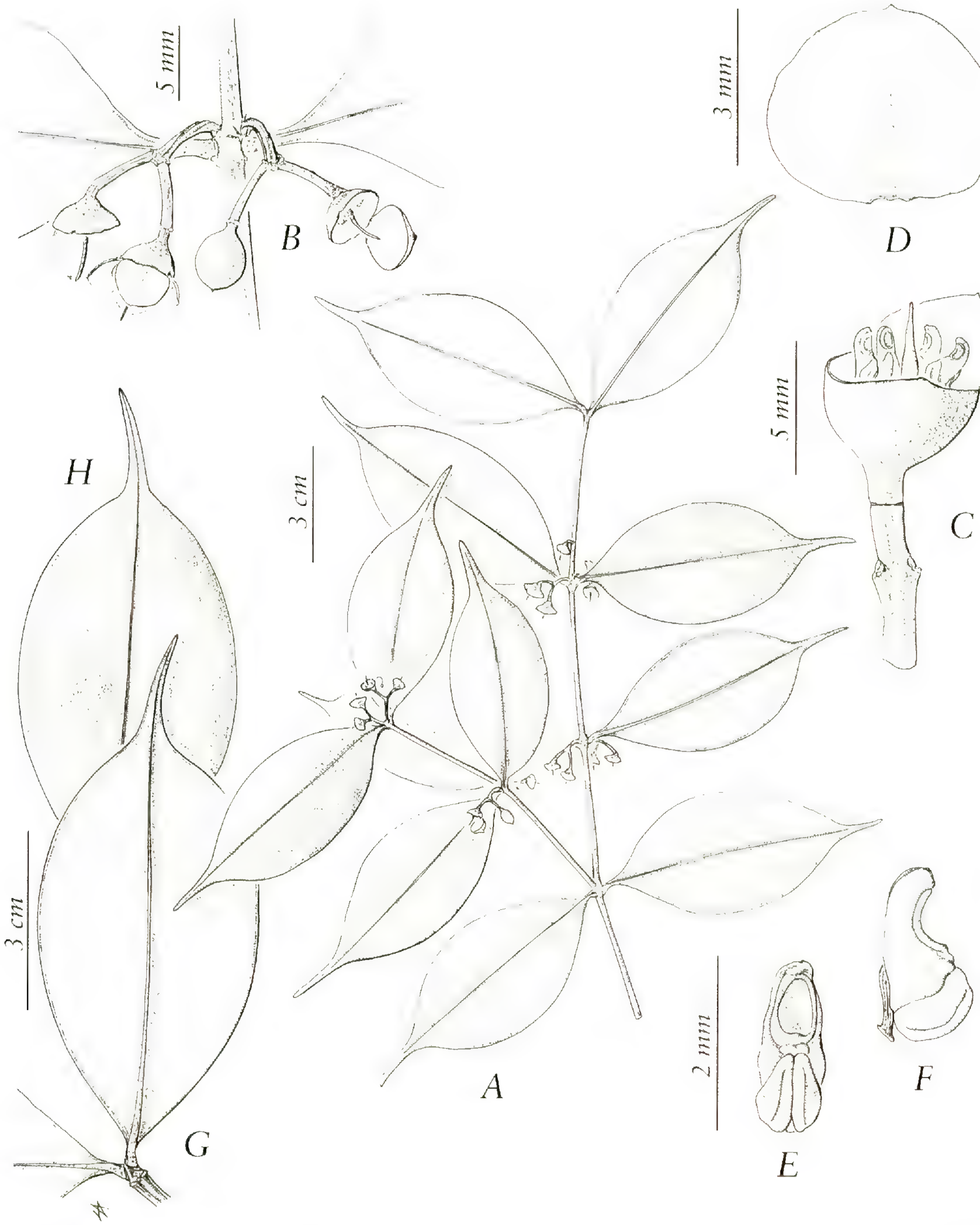

Figure 2. *Memecylon batekeanum* R. D. Stone & G. M. Walters. —A. Flowering branch. —B. Inflorescence with calyptrate calyx. —C. Flower with three petals removed. —D. Petal. —E. Anther, frontal view. —F. Anther, lateral view. —G. Leaf, abaxial surface. —H. Leaf, adaxial surface. Drawn from the holotype *Walters et al. 967* (MO).

internode); internodes mostly 3–5 cm long. Leaves thinly coriaceous, dark green and somewhat shining above, dull and much paler below (drying brown); petioles 3–4 mm long; blades elliptic, (5.6–)6.5–8.0 (–8.5) × (2.9–)3.1–3.8(–4.1) cm, cuneate at base, rounded and then abruptly acuminate at the apex; acumen slender, mostly 1.2–1.6 cm long, often curved; mid-nerve finely impressed on the upper surface, prominent on the lower surface; transverse nerves scarcely visible, faintly impressed on the upper surface in dried material, obscure on the lower surface, 12 to 14 pairs oriented at slightly oblique angles relative to the mid-nerve and closely spaced (2–5 mm) relative to one another; lateral nerves situated < 1 mm from the margin, scarcely visible. Cymes 1–1.5 cm long, geminate or solitary in the axils

(rarely at older nodes below the current leaves or at bracteolate nodes alternating with those bearing fully developed leaves), 1- to 2(to 3)-flowered, with terminal flower usually absent; peduncles 2–5 mm long; primary axes (2.5–)3–5 mm long; secondary axes lacking; bracts deciduous, not seen. Flowers with pedicels 0.5–1 mm long; hypantho-calyx with thick texture, subglobose in bud, ca. 4.5 mm long, 3.5–4 mm diam., apex conical and apiculate; calyx in bud entirely covering the corolla, calyptrate and falling off neatly (or remaining attached to one side) at anthesis leaving a truncate margin (the margin occasionally provided with 4 V-shaped sinuses ca. 1 mm deep); hypantho-calyx at anthesis broadly campanulate, 2.5–3 × 5 mm; petals lilac, ca. 4–4.5 × 4.5–5 mm, broadly ovate to suborbicular, apiculate, the mid-nerve keeled on the abaxial surface; anthers 2 × 1 mm; connective yellow, broadly saddle-shaped by the gland that occupies nearly the entire length on the dorsal side; filaments ca. 2.5 mm long; epigynous chamber with 8 parietal partitions and 8 interstitial lines; style robust, 4 mm long; ovary unilocular; ovules 12. Fruits not seen.

The epithet *batekeanum* refers to the type locality and to the Batéké people who live in this region. The rolling hills of the Batéké Plateaux, which extend well into the adjacent Republic of Congo, are formed of Kalahari sands, which are the deepest sand deposits in the world (Haddon et al., 2000). Annual rainfall does not exceed 1600 mm and occurs in two seasons of October to December and February to May. Vegetation cover is a mosaic of grassland maintained by anthropogenic fire and forest confined to the moist river valleys (Koechlin, 1961). The savanna is heavily populated by *Hymenocardia acida* Tulasne (Euphorbiaceae) and *Annona senegalensis* Persoon (Annonaceae), and is often dominated by *Ctenium newtonii* Hackel (Poaceae) and other graminoid and Cyperaceae species including *Schizachyrium thollonii* (Franchet) Stapf (Poaceae), *Loudetia simplex* (Nees) C. E. Hubbard (Poaceae), and *Rhynchospora candida* (Nees) C. B. Clarke (Cyperaceae). The adjacent forest contains many common species of the Guineo-Congolian region (sensu Monod, 1957; White, 1983), including *Anonidium mannii* (Oliver) Engler & Diels (Annonaceae), *Uapaca paludosa* Aubréville & Leandri (Euphorbiaceae), *Santiria trimera* (Oliver) Aubréville (Burseraceae), and *Pentaclethra macrophylla* Bentham (Fabaceae). Other Melastomataceae species occurring in the understory include *Memecylon* aff. *sitanum* Jacques-Félix, *M. occultum*, *Spathandra blakeoides* (G. Don) Jacques-Félix, and the riverine *Dichaetanthera strigosa* (Cogniaux) Jacques-Félix. The sandy substrate and fire regime do not seem to contribute to plant endemism in the area, as psammophytes are abundant and pyrophytes are nearly absent in the flora. The Guineo-Congolian forest species present in the area are evidently shared with a larger forested block to the north and west; however, there are minor floristic influences from the Sudano–Zambesian region (Walters et al., 2006).

Although *Memecylon batekeanum* is common at its type locality, the species is currently known from a single flowering collection. It may well be a localized endemic with an Area of Occupancy (AO) of perhaps no more than 10 km^2. It is furthermore found within the buffer zone of the Batéké Plateaux National Park, where the riverine forest is most likely kept in check by anthropogenic fire. This combination of factors suggests a provisional conservation status of Vulnerable (VU D2), as defined by the IUCN (2001).

The new species closely resembles *Memecylon amshoffiae* of Cameroon, especially in its leaf morphology and texture, color of the leaves on drying, axillary inflorescences, and size and texture of the hypantho-calyx. The petals and anthers of the two taxa are identical in both morphology and color; even their ecology is similar (riverine forest). In addition, they are resolved as sister taxa in molecular phylogenetic trees, and they share an unusual, 82-base repeat in the ITS2 region of nuclear ribosomal DNA (Stone, 2004).

In both species, the corolla in bud is entirely concealed by the calyx (an unusual feature in *Memecylon*). However, whereas in *M. amshoffiae* the calyx separates at anthesis into four valvate lobes with intervening sinuses 2–3 mm deep, in *M. batekeanum* the calyx is calyptrate and falls off neatly leaving a truncate margin (occasionally with 4 shallow indentations). The new species also differs in its shrubby habit, quadrangular-alate young branchlets, and shorter, fewer-flowered cymes (1–1.5 cm long and mostly 1- to 2-flowered vs. generally 2–3.5 cm long and 3- to 7-flowered in *M. amshoffiae*). The ranges in length of the peduncle, the primary inflorescence axes, and the pedicels overlap in the two species, although in *M. batekeanum* these measurements are usually less. Furthermore, the cymes of *M. amshoffiae* often have secondary branches, whereas in *M. batekeanum* these are evidently absent. Other subtle differences are found in the leaf dimensions; in *M. batekeanum* the blades are somewhat shorter relative to their width (mostly less than 2.5 times longer than wide vs. greater than 2.5 times longer than wide in *M. amshoffiae*), the apex is more abruptly acuminate, and the acumen is more slender. In addition, the known populations of the two species are isolated from each other by a distance of about 700 kilometers.

Together, *Memecylon amshoffiae* and *M. batekeanum* appear closely related to yet another riparian

species, *M. diluviorum* Exell, which ranges from Angola (Cabinda, the type region) to Gabon (see Jacques-Félix, 1983b, and recent collections at CAS and MO). However, *M. diluviorum* notably differs from the *M. amshoffiae–M. batekeanum* species pair in that the corolla in bud is well exposed by the truncate calyx, which at anthesis becomes evenly parted into four segments with intervening, V-shaped sinuses ca. 1.5 mm deep. Jacques-Félix (1983b) previously treated *M. diluviorum* in section *Polyanthema*, and both *M. amshoffiae* and *M. batekeanum* are provisionally placed in this section (Stone, 2004).

An additional Gabonese collection that is obviously allied with *Memecylon amshoffiae* and *M. batekeanum* was made in Ogooué-Maritime (or Nyanga?) province, 32 km north of Igotchi-Mouenda (12 May 1997, *G. McPherson 16950*, CAS). This specimen, taken from a tree 7 m high, is distinguished mainly by its calyx, which ruptures irregularly and eventually falls off leaving a very thick and sinuately 4-lobed margin (vs. valvately 4-lobed in *M. amshoffiae*, calyptrate in *M. batekeanum*). *McPherson 16950* may represent yet another new (albeit closely related) species, which would not be very surprising given the prevalence of regional and local endemism in African *Memecylon*.

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Literature Cited

Bremer, K. 1982. *Lijndenia*, a re-established paleotropical genus of the Melastomataceae–Memecyleae. Nordic J. Bot. 2: 121–124.

Haddon, I. G. 2000. Kalahari group sediments. Pp. 173–181 *in* T. C. Partridge & R. R. Maud (editors), The Cenozoic of Southern Africa. Oxford Monographs on Geology and Geophysics, Vol. 40.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Jacques-Félix, H. 1978a. Les subdivisions du genre *Memecylon* (Melastomataceae) en Afrique. Adansonia, ser. 2, 17: 415–421.

———. 1978b. Les genres de Memecyleae (Melastomataceae) en Afrique, Madagascar et Mascareignes. Adansonia, ser. 2, 18: 221–235.

———. 1979. Espèces nouvelles et peu connues du genre *Memecylon* (Melastomataceae) en Afrique. Adansonia, ser. 2, 18: 409–432.

———. 1983a. Mélastomatacées. *In*: B. Satabié & J.-F. Leroy (editors), Flore du Cameroun 24: 1–181. Délégation Générale à la Recherche Scientifique et Technique, Yaoundé.

———. 1983b. Mélastomatacées. *In*: J.-F. Villiers (editor), Flore du Gabon 25: 1–168. Muséum National d'Histoire Naturelle, Laboratoire de Phanérogamie, Paris.

Koechlin, J. 1961. La Végétation des Savanes dans le Sud de la République du Congo (Capitale Brazzaville). ORSTOM, Montpellier, France.

Monod, T. 1957. Les Grandes Divisions Chorologiques de l'Afrique. Comité consultatif tropical africain/Conseil scientifique pour l'Afrique, Publ. no. 24, London.

Stone, R. D. 2004. Phylogenetic Systematics of Melastomataceae, Subfamily Olisbeoideae. Ph.D. Dissertation, University of California, Berkeley.

———. 2006. Phylogeny of major lineages in Melastomataceae, subfamily Olisbeoideae: Utility of nuclear glyceraldehyde 3-phosphate dehydrogenase (*GapC*) gene sequences. Syst. Bot. 31: 107–121.

Walters, G., A. Bradley & R. Niangadouma. 2006. Floristic affinities of Gabon's Batéké Plateaux: Guineo-Congolian plants on Kalahari sands. Pp. 259–266 *in* S. A. Ghazanfar & H. J. Beentje (editors), Taxonomy and Ecology of African Plants, Their Conservation and Sustainable Use. Royal Botanic Gardens, Kew.

White, F. 1983. Vegetation of Africa: A Descriptive Memoir to Accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa. UNESCO, Paris.

Phainantha shuariorum (Melastomataceae), una Especie Nueva de la Cordillera del Cóndor, Ecuador, Disyunta de un Género Guayanés

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Abstract. *Phainantha shuariorum* (Melastomataceae) from sandstone mountains of the Cordillera del Cóndor region in southeastern Ecuador is described and illustrated; it is a disjunct species in a genus that is otherwise known only from the Guayana Shield region of northeastern South America. It resembles *P. laxiflora* and *P. maguirei*, with which it shares the climbing, twining habit, adventitious roots at the stem nodes, and leaves alternate by abortion of one leaf per pair, but from which it differs in the tri-nerved venation.

Resumen. Se describe e ilustra *Phainantha shuariorum* (Melastomataceae) de las montañas de arenisca de la región de la Cordillera del Cóndor en el sudeste de Ecuador; es una especie disyunta de un género que, de otra forma, sólo se conoce del Escudo Guayanés en el nordeste de América del Sur. Se parece a *P. laxiflora* y *P. maguirei* por el hábito trepador y voluble, las raíces adventicias en los nudos del tallo y las hojas alternas por aborto de una de las hojas de cada par; pero se distingue de ambas por tener la nervadura trinerve.

Key words: Cordillera del Cóndor, Ecuador, Guayana Shield, IUCN Conservation Status Near Threatened (NT), Melastomataceae, *Phainantha*.

Phainantha Gleason es un género pequeño de Melastomataceae con cinco especies, cuatro de las cuales se encuentran restringidas al sudeste de Venezuela y occidente de Guyana y una quinta especie endémica del sur de Ecuador que se describe a continuación. Las especies de este género son hierbas terrestres, trepadoras leñosas o epífitas, la mayoría enraizadas en los nudos del tallo, con las hojas opuestas o con más frecuencia de apariencia alterna por aborto de una de las hojas de cada par; las inflorescencias son cimoso-paniculadas o umbeliformes, las flores son 4-meras, el hipanto es terete y caliptriforme, la caliptra se desprende antes de la antesis; los pétalos son blancos o rosados; los 8 estambres dimórficos tienen las anteras linear-subuladas y recurvadas, dehiscentes por un poro apical pequeño; el conectivo no prolongado o cortamente así, con un apéndice basal cordiforme o panduriforme; el ovario es súpero, libre, 4-locular, el estilo es glabro y el estigma punctiforme; el fruto es una cápsula 4-locular, loculicida (Luckana & Berry, 2001; Wurdack, 1973a; Wurdack & Renner, 1993). Gleason estableció el género *Phainantha* luego de que se descubrieron las flores de una especie originalmente descrita en *Adelobotrys* DC. (Schulman & Hyvönen, 2003); de hecho ese estudio reciente demuestra que estos géneros tienen poco en común dentro de la tribu Merianieae, una tribu cuyos límites genéricos son aún problemáticos (Wurdack, 1973b; véase referencias adicionales en Schulman & Hyvönen, 2003).

Las exploraciones botánicas a la remota Cordillera del Cóndor en la región sur oriental de Ecuador han arrojado hallazgos muy interesantes y la presencia de una especie nueva de *Phainantha*. El Cóndor se encuentra entre Ecuador y Perú y hasta 1998 fue una zona de conflicto limítrofe que había sido muy poco explorada biológicamente. El limitado acceso a principios de los años 1990 resultó en el descubrimiento de varias especies nuevas y reveló un enlace biogeográfico inesperado entre el Cóndor y el Escudo Guayanés, región ubicada a 3000 kilómetros en el nordeste de América del Sur. Las cimas de la Cordillera, que se elevan hasta los 2900 m, están compuestas en parte de rocas areniscas muy pobres en nutrientes, similares (pero geológicamente más jóvenes) a las mesetas de los tepuyes guayaneses (Berry et al., 1995). Varios géneros de plantas casi endémicos a la región guayanesa se han encontrado en la región de la Cordillera del Cóndor en los últi-

Figura 1. *Phainantha shuariorum*. Izquierda. Hábito con hipantos maduros (foto cortesía de F. A. Werner). Derecha. Flor (foto D. A. Neill).

mos 15 años, sea del lado ecuatoriano o peruano de la frontera, entre ellos *Stenopadus* S. F. Blake (Asteraceae), *Digomphia* Bentham (Bignoniaceae), *Erardia* Ridley (Cyperaceae), *Euceraea* Martius (Flacourtiaceae), *Phainantha* (Melastomataceae), *Pterozonium* Fée (Pteridaceae), *Perissocarpa* Steyermark & Maguire (Ochnaceae), *Bonnetia* Martius (Theaceae) y *Aratitiyopea* Steyermark & P. E. Berry (Xyridaceae). Hoy en día el proyecto de colaboración entre el Herbario de la Universidad Nacional de Loja, el Herbario Nacional del Ecuador, el Missouri Botanical Garden y las comunidades indígenas del grupo étnico Shuar, que se ubican en la región de la Cordillera del Cóndor, lleva a cabo inventarios florísticos que sin duda resultarán en otros descubrimientos interesantes y conexiones con el Escudo Guayanés. Si bien ya se sabía de esta nueva especie (Wurdack, anotaciones en ejemplares de herbario en 1990; Luckana & Berry, 2001; Renner, 1999), sólo recientemente se la ha recolectado con flores y es posible describirla.

Phainantha shuariorum C. Ulloa & D. A. Neill, sp. nov. TIPO: Ecuador. Zamora-Chinchipe: Cantón El Panqui. Vicinity of mining camp, Río Tundayme, along road to military base El Condor, montane forest, 1500 m, 7 Nov. 2004, *H. van der Werff, B. Gray & W. Quizhpe 19410* (holotipo, QCNE; isotipos, LOJA, MO). Figuras 1 y 2.

Liana gracilis nodis radicibus adventitiis praeditis et foliis alternis *Phainanthae laxiflorae* et *P. maguirei* similis sed ab ambabus foliis 3-nervatis vice 5 ad 7-nervatis, a *P. laxiflora* foliis minoribus, a *P. maguirei* foliis ellipticis, non cordatis recedit.

Figura 2. *Phainantha shuariorum.* —A. Hábito con inflorescencia. —B. Detalle del ápice de la hoja por el envés. —C. Botón floral caliptrado. —D. Pétalo. —E. Hipanto acrescente. —F. Estambres dimórficos. —G. Pistilo. —H. Cápsula madura. —I. Semilla. (C–E a la misma escala, F y G a la misma escala). A–D, F y G de *van der Werff 19419*; E de *Werner 1346*; H e I de *Neill 1407*. Ilustración de C. Ulloa Ulloa.

Trepadora leñosa; tallos volubles, café-rojizos, adpresos a los troncos de los árboles, con raíces adventicias en los nudos; tallos, ramas, pecíolos, envés de las hojas e inflorescencia densa a esparcidamente setosos y glabrescentes con la edad. Hojas alternas por aborto de las hojas de uno de los lados del tallo, adpresas a los troncos; láminas elípticas, 2.0–9.5 × 0.6–4.4 cm, acuminadas en el ápice, cuneadas en la base, el margen sinuado y diminutamente dentado, coriáceas, ciliadas en el margen, glabras y

brillantes en la haz, opacas en el envés, 3-nervias con los nervios laterales a menos de 1 mm del borde de la lámina, la nervadura secundaria pinnada, con 5 a 11 nervios espaciados, inconspicua en la haz, ligeramente visible en el envés; pecíolo grueso, 5–15 mm. Inflorescencias axilares, 5–19 cm de largo, cimoso-paniculadas, con 3 a 18 flores o las flores solitarias, el eje rosado oscuro; pedicelos delgados, de hasta 8 mm. Hipanto 10–15 mm de largo, rosado muy pálido, esparcidamente setoso-glandular, al madurar volviéndose 1-angulado con costillas marcadas, fibrosas y persistentes en el fruto; cáliz ca. 2 mm de alto, irregularmente truncado; pétalos 6.5–9 × 5.5–7 mm, blancos, obovados, apiculados, glabros, campanulados; estambres glabros, los filamentos cortos 1–4.3 mm, los largos 5–5.5 mm de largo, las tecas cortas 1.5–7 mm, las largas 8.5–12 mm de largo, dehiscentes por un poro apical ventralmente inclinado, el apéndice basal 0.3–0.5 mm de largo; ovario 5.5–8 mm de largo, diminutamente glandular en el ápice, el estilo 10–12 mm de largo, recurvado en la parte apical. Cápsula fusiforme, 10–15 × 3–5 mm, café, con las costillas fibrosas persistentes; semillas numerosas, con un núcleo central y testas alargadas a ambos extremos, ca. 2 mm de largo total.

Phainantha shuariorum se parece a *P. laxiflora* (Triana) Gleason y *P. maguirei* Wurdack por el hábito trepador y voluble, los nudos del tallo enraizados, las hojas alternas y la inflorescencia paniculada laxa. Sin embargo se distingue por su nervadura principal marcadamente 3-nervia en lugar de 5 ó 7-nervia como tienen las especies guayanesas. La nervadura lateral se encuentra tan cerca del borde de la lámina que da la apariencia de ser un margen grueso y como si la lámina solo tuviera el nervio central; esto y la falsa posición alterna de las hojas dan un aspecto inusual a esta especie y confusión inicial en cuanto a qué familia pertenece. Se distingue además de *P. laxiflora* por tener las hojas más pequeñas y glabrescentes (en vez de hasta 16 cm de largo y densamente setulosas) y de *P. maguirei* por tener las hojas más bien lanceoladas en lugar de acorazonadas. Si bien *P. myrteoloides* Wurdack tiene tallos enraizados y adpresos y presenta láminas 3-nervias, se diferencia por su hábito con aspecto de *Myrteola* con hojas opuestas de menos de 1.5 cm.

Hábitat, distribución, fenología y conservación. Endémica de los bosques de la Cordillera del Cóndor, en las provincias de Morona-Santiago y Zamora-Chinchipe, Ecuador, entre 1000 y 1500 m. Es localmente abundante, pero exclusivamente en los bosques sobre roca arenisca, en donde los árboles son relativamente bajos y con troncos delgados; los tallos de *Phainantha shuariorum* se encuentran trepando a un gran número de árboles en esos bosques. Es probable que la especie existe también en el lado peruano de la frontera internacional, en la Cordillera del Cóndor, y posiblemente en otras mesetas de areniscas en el nororiente de Perú que aún no han sido inventariados por su flora. Se la ha recolectado en flor en octubre y noviembre y en fruto en julio, octubre y noviembre. Se le asigna la categoría de Casi Amenazada (NT) según la UICN (2001). Sin embargo hay que anotar que, si bien la especie es abundante en el lugar, la zona de El Cóndor no se encuentra bajo el Sistema Nacional de Áreas Protegidas del Ecuador y existen actividades mineras que podrían poner en peligro no solo a esta especie, sino a varios de los tesoros botánicos de esta zona. Las comunidades Shuar de la región, que pertenecen a la organización regional "Circunscripción Territorial Shuar Arutam (CTSHA)", han manifestado su intención de proteger en perpetuidad toda la rica biodiversidad de su territorio ancestral, incluyendo particularmente las especies endémicas de flora en las mesetas de arenisca, y han presentado un plan al Ministerio del Ambiente del Ecuador para la declaratoria de un "Área Protegida Indígena" en toda la zona que sería administrada por las propias comunidades Shuar de la CTSHA.

Etimología. El nombre de la especie está dedicado al pueblo indígena Shuar, en forma colectiva; el epíteto *shuariorum* es el caso genitivo plural. La Cordillera del Cóndor, donde se ha encontrado la especie nueva, es parte del territorio ancestral de los Shuar. Las comunidades Shuar del Ecuador están activamente participando en la planificación y las acciones a tomar para el manejo, la conservación y la protección de los recursos naturales de esta zona.

Paratipos. ECUADOR. **Morona-Santiago:** Cantón Gualaquiza, Cordillera del Cóndor, ridge top Banderas, near disputed Ecuador-Peru border, A. *Gentry 79996* (MO, QCNE, US n.v.); Cuenca del Río Coangos, a una hora del Centro Shuar Banderas, margen del Río Tsuirin, *J. C. Ronquillo, P. Fuentes* & A. *Tankamash 928* (MO, QCNE); Cantón Limón-Indanza, Cordillera del Cóndor, Centro Shuar Warints, *D. Neill & Shuar conservation interns 14079* (LOJA, MO, QCNE); *J. L. Clark 7055* (QCNE, US); Cordillera del Cóndor, Centro Shuar Warints, Cumbre del Cerro Chirichik Naint, A. *Wisum* y *Grupo Shuar de Conservación 30* (MO, QCNE); Centro Shuar Yunkumas, Cerro Chuank Naint, *D. Neill & VSF dendrology course 14605* (LOJA, MO, QCNE). **Zamora-Chinchipe:** Cantón Nangaritza, Río Nangaritza, Shaimi, *J. Homeier, F. Werner, M. Lehnert* & V. *Mandl 1503* (BIEL n.v., LOJA, MO, QCNE). *F. Werner 1346* (MO, QCNE); Río Nangaritza, Miazi, Hill above military post, *D. Neill & W. Palacios 9608* (MO, QCNE, US); W. *Palacios 6711* (MO, QCNE); W. *Palacios, J. Vargas & C. Galarza 8565* (MO, QCNE, TEX n.v., US n.v.).

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Literatura Citada

Berry, P. E., O. Huber & B. K. Holst. 1995. Floristic analysis and phytogeography. Pp. 161–191 *in* P. E. Berry, B. Holst & K. Yatskievych (editors), Flora of the Venezuelan Guayana. Vol. 1. Missouri Botanical Garden Press, St. Louis.

Luckana, N. G. & P. E. Berry. 2001. *Phainantha* (Melastomataceae). Pp. 488–490 *in* P. E. Berry, B. Holst & K. Yatskievych (editors), Flora of the Venezuelan Guayana. Vol. 6. Missouri Botanical Garden Press, St. Louis.

Renner, S. S. 1999. *Phainantha* (Melastomataceae). *In:* P. M. Jørgensen & S. León-Yánez (editors), Catalogue of Vascular Plants of Ecuador. Monogr. Syst. Bot. Missouri Bot. Gard. 75: 582.

Schulman, L. & J. Hyvönen. 2003. A cladistic analysis of *Adelobotrys* (Melastomataceae) based on morphology, with notes on generic limits within the Tribe Merianieae. Syst. Bot. 28: 738–756.

UICN. 2001. Categorías y Criterios de la Lista Roja de la UICN: Versión 3.1. Comisión de la supervivencia de especies de la UICN. UICN, Gland, Suiza y Cambridge, Reino Unido.

Wurdack, J. J. 1973a. Melastomataceae. Pp. 1–737 *in* T. Lasser (editor), Flora de Venezuela, Vol. 8. Instituto Botánico, Caracas.

———. 1973b. Melastomataceae. Pp. 1–405 *in* G. Harling & B. Sparre (editors), Flora of Ecuador, no. 13. Swedish Natural Science Research Council, Stockholm.

——— & S. Renner. 1993. Melastomataceae -Melastomatoideae. Pp. 1–301 *in* A. R. A. Görts-van-Rijn (editor), Flora of the Guianas, ser. A, 13. Fam. 99. Koeltz Scientific Books, Koenigstein.

A New Species of *Pedicularis* (Scrophulariaceae) from the Yaoshan Mountain, Yunnan, China

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Abstract. *Pedicularis yaoshanensis* H. Wang from Yunnan, China, is described and illustrated. The new species was found growing on wet cliffs, at high elevations in the Yaoshan Mountain. It is placed in *Pedicularis* series *Longiflorae* Prain. The main diagnostic features of *P. yaoshanensis* include its acaulescent habit, pinnatipartite leaves, calyx with 3 lobes (the posterior one smaller and tripartite), the deflexed galea beak pointing downward, and the two posterior filaments of the stamens glabrous. A key to similar species is given, and its relationships discussed.

Key words: China, northeastern Yunnan, *Pedicularis*, Scrophulariaceae.

Pedicularis L. is the largest genus of the family Scrophulariaceae as traditionally recognized (Mill, 2001). Between 600 and 800 *Pedicularis* species are distributed primarily in the Arctic and alpine regions of the northern hemisphere (Macior, 1988; Wang et al., 2003). At least 367 species occur in China (H.-B. Yang et al., 1998, and species subsequently published by Yamazaki, 2000, 2001, 2003; F.-S. Yang et al., 2003), where it is the fourth-largest angiosperm genus after *Rhododendron* L., *Carex* L., and *Astragalus* L. (Wu et al., 2003). *Pedicularis* is best represented in the mountains of southwestern China, which represents one of the main centers of species diversity for the genus (H.-B. Yang et al., 1998; Mill, 2001).

There are 152 species, including 53 endemic species, now recognized within the genus *Pedicularis* in Yunnan, China, which is a center of diversity and endemism (Li et al., 2002; Wang, 2005). All four corolla types recognized in *Pedicularis* by Li (1951) occur in Yunnan; his advanced corolla type with a beak and slender elongated tube is limited in its distribution to the Sino-Himalayan region, and only 16 species have these elongated corolla tubes in Yunnan.

Rising from the upper reaches of the Yangtze River, the Yaoshan Mountain lies in the border area between northeastern Yunnan and southern Sichuan provinces. During recent fieldwork by us, 17 species of *Pedicularis* were found in the Yaoshan Mountain. Of these, only the new species belongs to the advanced corolla type of Li (1951).

Pedicularis yaoshanensis H. Wang, sp. nov. TYPE: China. Yunnan: Qiaojia county, Yaoshan Mountain, 27°11′N, 103°04′E, 3600–3700 m, 17 Aug. 2004, *Hong Wang & Shu-dong Zhang 03-0857* (holotype, KUN). Figure 1.

Species nova cum *P. latituba* Bonati et *P. lobatorostrata* T. Yamazaki (ser. *Longiflorae*) corollae labelli lobo mediano emarginato et galeae rostro apice bilobato congruens sed humilior subacaulis, pedicellis multo minoribus, 1–2 mm tantum (non 10–20 mm), calyce minore 5–6 mm longo (non 8–10 mm ut in *P. latituba*, 13–20 mm in *P. lobatorostrata*), rostro galeae corollae minore 3 mm longo (non 5–6 mm), filamentis posticis glabris differt.

Perennial dwarf clustered herb, to 6 cm tall including the flowers, sometimes drying slightly black; roots ± lignified, long-conical, branched, 5–7 cm long, ca. 1 mm diam., drying brown; stems erect, much reduced and almost absent, only 5–10 mm tall, basally obscured by withered petiole bases and brown membranous scales. Leaves alternate, clustered;

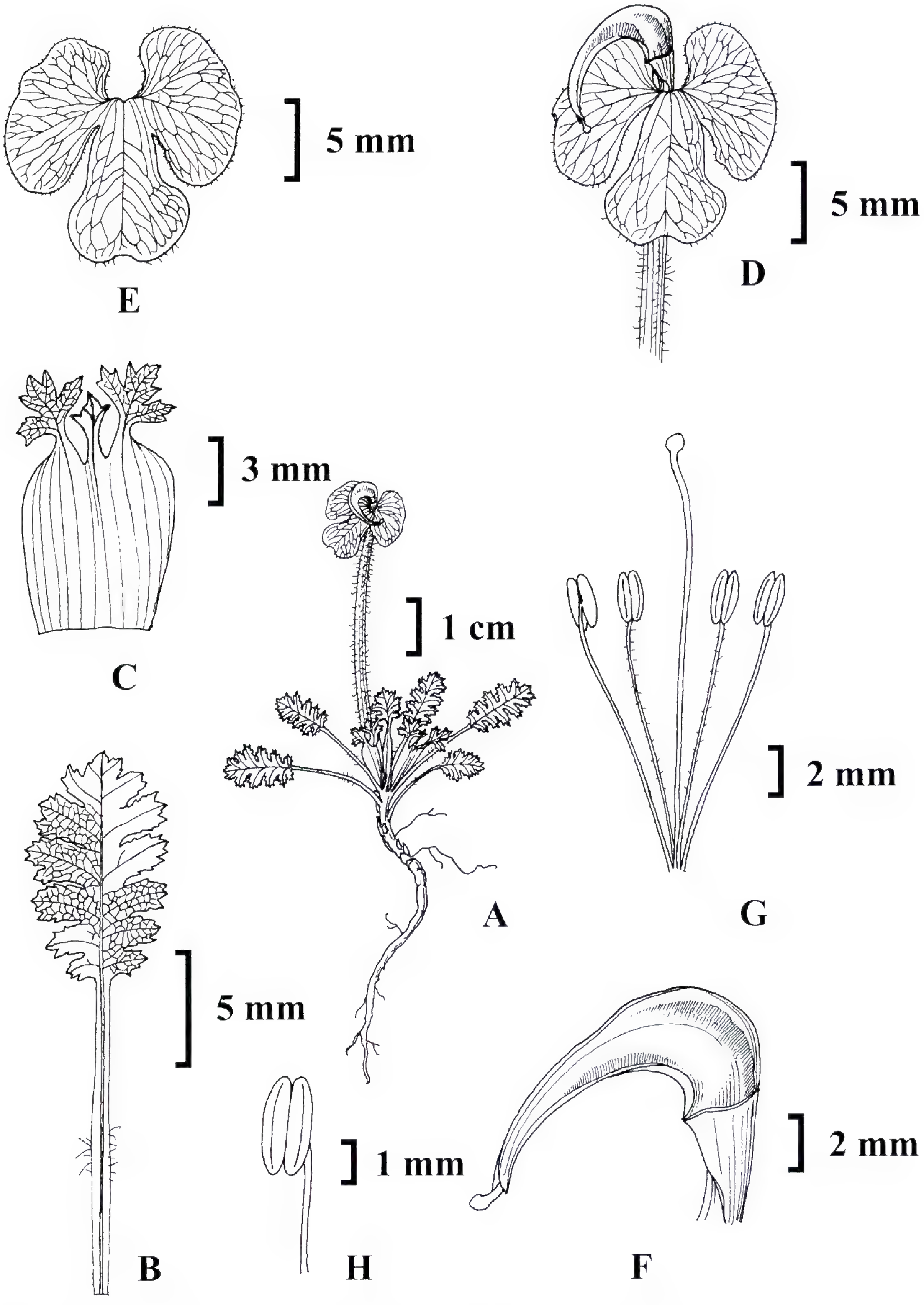

Figure 1. *Pedicularis yaoshanensis* H. Wang. —A. Habit. —B. Leaf. —C. Calyx opened out; posterior tooth in center. —D. Upper part of corolla tube and upper and lower corolla lips. —E. Corolla lower lip dissected out. —F. Upper lip (galea). —G. Stamens and style dissected out; anterior filaments furthest from style. —H. Anther and upper part of filament. Drawn by Xi-Lin Wu from the holotype, *Hong Wang & Shu-dong Zhang 03-0857* (KUN).

petioles 10–20 mm long, drying yellow, widely membranous winged along their length, pilose only for a short distance in the middle, the proximal and distal portions glabrous; blades obovate-elliptic, 14–17 × 6–9 mm, obtuse at apex, glabrous, pinnatipartite, with 3 to 7 pairs of segments, each segment to 1 mm long, serrate, shortly cuspidate at apex, furfuraceous, with veins and veinlets prominent beneath. Flowers 1 to 4, axillary, pedicellate, the pedicels 1–2 mm long, densely long-pilose; calyx campanulate, 9–10 mm long overall, the tube 5–6 × 4 mm, densely long-pilose outside with trichomes ca. 0.1 mm, 1/3 cleft anteriorly and slightly constricted at the mouth, membranous, with 3 prominent veins and numerous veinlets, 3-lobed, calyx lobes leaf-like, furfuraceous, the posterior lobe 2 × 2 mm, smaller than the lateral lobes but equaling or longer than their individual lobules, subelliptic but tripartite, attenuate into a long petiolule; lateral lobes 4 × 3 mm, alternate, oblique and anisomerous at base, attenuate into short, broad petiolules, the upper foliaceous part expanded and orbicular in outline, tripartite, the lateral lobules oblong-obovate, each with 2 or 3 distal teeth, the terminal lobule of each lobe more broadly obovate and more deeply 3-toothed than the 2 lateral lobules; corolla crimson, with white throat; corolla tube 32–43 mm long, cylindrical, not dilated at the apex, densely pilose with thin hairs outside; the erect part of galea about as wide as the tube, gradually broadening above, slightly notched on anterior side at the apex and at almost 90° to the inflexed anther-bearing portion; anther-bearing portion of galea slightly protuberant, glandular; beak falcately curved, ca. 10 mm long, obliquely pointing downward, 2-partite at apex, the lobules broadly band-shaped, ca. 2 mm long; lower lip 3-lobed, shortly ciliate on margins (× 10 lens), the middle lobe oblong-obovate, 8–10 × 5–7 mm, abruptly slightly expanded distally at the middle, the distal half broadly orbicular, retuse at apex, the auriculate base attenuate into a short stipe; lateral lobes longitudinally reniform, 10 × 6 mm, directed slightly backward; staminal filaments inserted at the top of the corolla tube, ca. 10 mm long, 2 anterior ones sparsely pilose, 2 posterior ones glabrous, anthers ellipsoid; style slightly exserted from beak. Capsule and seeds unknown.

Etymology. The new species is named for the type locality, Yaoshan Mountain of Yunnan Province, China.

Distribution and ecology. *Pedicularis yaoshanensis* is probably an endemic species; it has only been collected at the type locality in the Yaoshan Mountain, northeastern Yunnan. According to field investigations, only one population of this new species was found. There are approximately 100 mature individuals observed on the wet cliffs.

Relationships. *Pedicularis yaoshanensis* differs markedly from previously known species in the genus. It shows resemblances to species belonging to two different series of the genus, series *Pumiliones* Prain and series *Longiflorae* Prain. In its dwarf habit, petiolate leaves, rather long corolla tubes, and corollas with broad, plump lower lips, *P. yaoshanensis* resembles the species placed in series *Pumiliones*. This series comprises two species: *P. przewalskii* Maximowicz (endemic to northwestern and southwestern China, in alpine meadows) and *P. bella* Hooker f. (distributed in Tibet (Xizang, China) and Sikkim, in alpine meadows, steep slopes, and cliff faces). However, *P. yaoshanensis* differs from both these species by pinnatipartite leaves, deflexed galea beak obliquely pointing downward, and glabrous posterior filaments. It is clearly distinguished additionally from *P. bella* by glabrous leaves, a 3-lobed calyx, and especially a different corolla structure. In *P. bella*, the middle lobe of the corolla lower lip is much smaller than the laterals, which curve upward and hide the galea (see photograph: Ree, 2005, fig. 4), whereas in *P. yaoshanensis* the middle lobe of the corolla lower lip is the same size as the lateral ones and the whole lower lip is outspread, not concealing the galea. Its 3-lobed calyx also distinguishes *P. yaoshanensis* from most infraspecific taxa within *P. przewalskii*, except for *P. przewalskii* subsp. *microphyton* (Bureau & Franchet) P. C. Tsoong (= *P. microphyton* Bureau & Franchet). This subspecies has two varieties: variety *microphyton* has a white or pale yellow lower corolla lip that is not ciliate, while variety *purpurea* (Bonati) P. C. Tsoong (= *P. coppeyi* Bonati) from Sichuan has an entirely purple corolla with ciliate lower lip (H.-B. Yang et al., 1998). *Pedicularis yaoshanensis*, on the other hand, has a white corolla throat and a ciliate lower lip, thus combining characters of both varieties of *P. przewalskii* subsp. *microphyton*. However, *Pedicularis yaoshanensis* differs additionally from all infraspecific taxa of *P. przewalskii* by long conical roots, revolute leaf margins, and posterior calyx lobe smaller than the other two and tripartite.

In its 3-lobed calyx and corolla with a falcately curved beak, *Pedicularis yaoshanensis* resembles members of series *Longiflorae* more than it does series *Pumiliones*. Series *Longiflorae* is a large series of about 22 species, 19 of them occurring in China (H.-B. Yang et al., 1998; Yamazaki, 2003). All previously described species of this series whose habitat is known are plants of alpine meadows, often

in swampy habitats; *P. yaoshanensis* is apparently unique in occupying wet cliffs. Within series *Longiflorae*, *P. yaoshanensis* most resembles *P. humilis* Bonati, *P. latituba* Bonati, *P. lobatorostrata* T. Yamazaki, *P. sigmoidea* Franchet ex Maximowicz, and *P. siphonantha* D. Don on account of the emarginate corolla lower lip. Those five species are the only ones currently placed in series *Longiflorae* to have the combination of red-purple or pink corolla and an emarginate labellum. Neither species of series *Pumiliones* has an emarginate labellum, indicating that *P. yaoshanensis* is better placed in series *Longiflorae*, where the character state does occur. Its acaulescent habit easily separates *P. yaoshanensis* from *P. humilis* (which, despite the specific epithet, has stems 5–15 cm tall), *P. sigmoidea*, and *P. siphonantha*. Only *P. latituba* and *P. lobatorostrata* have stems typically not more than 3 cm tall and could be confused, in that respect, with *P. yaoshanensis*. *Pedicularis yaoshanensis* has a much smaller calyx than either of those species; its tube is only 5–6 mm long, as opposed to 8–10 mm in *P. latituba* and 13–20 mm in *P. lobatorostrata*. *Pedicularis yaoshanensis* also differs from both these species in glabrous posterior staminal filaments, although this character does occur in some species of series *Longiflorae* that lack the combination of acaulescent stem, red corolla, and emarginate labellum. *Pedicularis latituba* has a very distinctive bicolored corolla, the central area of each lobe of the labellum being a much deeper purple than the outer area. This further distinguishes it from *P. yaoshanensis*, which has the central area of the labellum paler or whitish, not darker. *Pedicularis yaoshanensis* resembles *P. lobatorostrata* in being dwarf and almost acaulescent (in *P. lobatorostrata* there is a 1.5–3 cm stem, whereas in *P. yaoshanensis* the stem is virtually absent) and in having red-purple corollas with long tubes 32–45 mm long and a deeply bilobed galea. However, *P. lobatorostrata* has a 5-lobed calyx, which is unusual in series *Longiflorae* and distinguishes it from both *P. yaoshanensis* (calyx with 3 lobes) and *P. latituba* (calyx with 2 or 3 lobes). *Pedicularis lobatorostrata* is additionally distinguished from *P. yaoshanensis* by its relatively narrower leaves, which are about 3–5 times (not 1.8–2.5 times) as long as broad.

The key below serves to identify *Pedicularis yaoshanensis* and the taxa mentioned in the discussion above. It includes all taxa belonging to series *Pumiliones*, but only those Chinese species of series *Longiflorae* having a red-purple corolla with an emarginate labellum and a stem less than 5 cm tall.

KEY TO SIMILAR SPECIES WITHIN *PEDICULARIS* SERIES *LONGIFLORAE* AND *PUMILIONES*

1a. Middle lobe of labellum emarginate; filaments either all pubescent or 2 glabrous (ser. *Longiflorae*) 2
1b. Middle lobe of labellum entire; all 4 filaments pubescent (ser. *Pumiliones*) 4
2a. Calyx tube 13–20 mm long, with 5 lobes at apex . . . . . *P. lobatorostrata*
2b. Calyx tube 5–10 mm long, with 2 or 3 lobes at apex 3
3a. Galea beak arcuate but not forming a semicircle, deeply bilobed at apex; calyx tube 5–6 mm long; 2 posterior filaments glabrous . . . . . *P. yaoshanensis*
3b. Galea beak forming a semicircle, not deeply bilobed at apex; calyx tube 8–10 mm long; all filaments pubescent . . . . . *P. latituba*
4a. Corolla labellum suberect and curved upward, partly hiding galea; galea beak S-shaped, entire, ca. 8 mm long . . . . . *P. bella*
4b. Corolla labellum spreading, not concealing galea; galea beak straight, 2-cleft, 5–6 mm long . . . . . (*P. przewalskii*) 5
5a. Corolla ± entirely deep purple except sometimes for whitish throat 6
5b. Corolla with dark galea and pale purple, cream, or whitish labellum 7
6a. Leaf blades sparsely pubescent to glabrous . . . . . *P. przewalskii* subsp. *przewalskii* var. *przewalskii*
6b. Leaf blades densely pubescent . . . . . *P. przewalskii* subsp. *australis*
7a. Calyx with 2 or 3 lobes . . . . . *P. przewalskii* subsp. *microphyton*
7b. Calyx with 5 lobes . . . 8
8a. Leaves glabrous or sparsely pubescent . . . . . *P. przewalskii* subsp. *przewalskii* var. *cristata*
8b. Leaves densely pubescent . . . . . *P. przewalskii* subsp. *hirsuta*

Paratype. CHINA. **Yunnan:** Qiaojia county, Yaoshan Mountain, 27 11′N, 103 04′E, 3700 m, 17 Aug. 2004, *Hong Wang & Shu-dong Zhang 03-0840A* (KUN, MO).

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Literature Cited

Li, H.-L. 1951. Evolution in the flowers of *Pedicularis*. Evolution 5: 158–164.

Li, W.-L., H. Wang & D.-Z. Li. 2002. Biogeography and species diversity of *Pedicularis* (Scrophulariaceae) of Yunnan. Acta Bot. Yunnan. 24: 583–590.

Macior, L. W. 1988. A preliminary study of the pollination ecology of *Pedicularis* (Scrophulariaceae) in Japan. Pl. Spec. Biol. 3: 61–66.

Mill, R. R. 2001. Notes relating to the flora of Bhutan: XLIII. Scrophulariaceae (*Pedicularis*). Edinburgh J. Bot. 58: 57–98.

Ree, R. 2005. Phylogeny and the evolution of floral diversity in *Pedicularis* (Orobanchaceae). Int. J. Pl. Sci. 166: 595–613.

Wang, H. 2005. *Pedicularis*. *In:* Flora Yunnanica 18. Science Press, Beijing.

———, R. R. Mill & S. Blackmore. 2003. Pollen morphology and infra-generic evolutionary relationships in some Chinese species of *Pedicularis* (Scrophulariaceae). Pl. Syst. Evol. 237: 1–17.

Wu, Z.-Y., A.-M. Lu, Y.-C. Tang, Z.-D. Chen & D.-Z. Li. 2003. The Families and Genera of Angiosperms in China, A Comprehensive Analysis. Science Press, Beijing.

Yamazaki, T. 2000. Seven new species of the genus *Pedicularis* (Scrophulariaceae) from Tibet (Nizang) and its adjacent region in China. J. Jap. Bot. 75: 213–222.

———. 2001. Two new species of the genus *Pedicularis* (Scrophulariaceae) from SW China. J. Jap. Bot. 76: 96–99.

———. 2003. New species of *Pedicularis* (Scrophulariaceae) from Western China and amendment for names of *Pedicularis* from Bhutan. J. Jap. Bot. 78: 198–202.

Yang, F.-S., D.-Y. Hong & X.-Q. Wang. 2003. A new species and a new specific synonym of *Pedicularis* (Scrophulariaceae) from the Hengduan Mountains, China. Novon 13: 363–367.

Yang, H.-B., N. H. Holmgren & R. R. Mill. 1998. *Pedicularis*. Pp. 97–209 *in* Z.-Y. Wu & P. H. Raven (editors), Flora of China, Vol. 18. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.

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Nomenclatural Innovations in Neotropical Salicaceae

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Abstract. *Macrothumia* M. H. Alford is described as a new genus of Salicaceae based on *Neosprucea kuhlmannii* Sleumer from Brazil. The deciduous perianth, papillate leaf teeth, presence of receptacular disk glands, and analyses of plastid DNA data suggest that the new genus is more closely related to *Ahernia* Merrill and *Pleuranthodendron* L. O. Williams than to *Banara* Aublet or *Neosprucea* Sleumer. The monotypic genus *Aphaerema* Miers of Brazil and Argentina is transferred to *Abatia* Ruiz & Pavón, based on analyses of plastid DNA sequences and on the lack of morphological discontinuities between the genera. Because the name *Abatia spicata* (Turczaninow) Sleumer already exists, *Abatia angeliana* M. H. Alford is published as a replacement name for *Aphaerema spicata* Miers. A lectotype for *Aphaerema spicata* is also designated. The monotypic Hispaniolan genus *Priamosia* Urban, originally described as separate from *Xylosma* G. Forster based on its few stamens (four, instead of eight to numerous), is transferred to *Xylosma*, and a neotype is designated for *Xylosma domingensis* (Urban) M. H. Alford.

Resumo. *Macrothumia* M. H. Alford é descrito como um novo gênero de Salicaceae, com base em *Neosprucea kuhlmannii* Sleumer do Brasil. O perianto decíduo, as papilas nos dentes das folhas, a presença de discos glândulares receptaculares e a análise de dados de DNA do plastídeo sugerem que o novo gênero é mais proximamente relacionado a *Ahernia* Merrill e *Pleuranthodendron* L. O. Williams do que a *Banara* Aublet ou *Neosprucea* Sleumer. O gênero monotípico *Aphaerema* Miers do Brasil e da Argentina é transferido para *Abatia* Ruiz & Pavón, com base em análises de seqüências de DNA do plastídeo e devido à ausência de descontinuidades morfológicas entre os gêneros. Em razão do nome *Abatia spicata* (Turczaninow) Sleumer já existir, *Abatia angeliana* M. H. Alford é publicado para substituir *Aphaerema spicata* Miers. Um lectótipo para *Aphaerema spicata* também é designado. O gênero monotípico *Priamosia* Urban, da ilha de Hispaniola, originalmente descrito fora de *Xylosma* G. Forster com base em seus poucos estames (quatro, em vez de oito a numerosos), é transferido para *Xylosma*, e um neótipo é designado para *Xylosma domingensis* (Urban) M. H. Alford.

Key words: *Abatia*, *Aphaerema*, Argentina, *Banara*, Brazil, Flacourtiaceae, Hispaniola, *Macrothumia*, *Neosprucea*, *Priamosia*, Salicaceae, *Xylosma*.

Based on recent phylogenetic analyses of Salicaceae using both morphological and molecular data (Alford, 2005; Chase et al., 2002), several taxonomic changes were deemed urgent and sufficiently well supported to precede a forthcoming treatment of the family in the Kubitzki-edited series *The Families and Genera of Flowering Plants* (S. Zmarzty, in prep.). Salicaceae now include a large part of the former Flacourtiaceae (Alford, 2005; Chase et al., 2002), and the taxa considered here were all formerly placed in Flacourtiaceae. Phylogenetic analyses indicate that the monotypic *Aphaerema* Miers is nested within *Abatia* Ruiz & Pavón, that the monotypic *Priamosia* Urban is nested within *Xylosma* G. Forster, and that the species usually treated as *Banara kuhlmannii*

(Sleumer) Sleumer [= *Veosprucea kuhlmannii* Sleumer] belongs in a separate genus allied more closely to *Pleuranthodendron* L. O. Williams and *Ahernia* Merrill.

Macrothumia, *Veosprucea*, and *Banara*

In 1950 Sleumer described a new species from Brazil as part of his recently established genus *Neosprucea* Sleumer. Sleumer (1936, 1938) had segregated *Neosprucea* from *Banara* Aublet based on the former having spiciform racemes with 4- or 5-merous flowers and linear-elongate anthers. In contrast, the remaining species of *Banara* usually have paniculate inflorescences (rarely racemose, fascicular, or with flowers solitary) with 3-merous flowers and globose to ellipsoidal anthers. Both genera have highly intruded parietal placentation and include several species with leaves that are 3-veined from the base. Sleumer's (1950) new species, *N. kuhlmannii*, had strongly 3-veined leaves and highly intruded parietal placentation, but he saw no material with flowers. Regardless, he was convinced that the new species belonged in *Neosprucea* due to its large fruit (> 3 cm diam.). Such a large fruit had never been observed in *Banara*, and the few available fruits of *Neosprucea* were larger than those of most *Banara*. Following the collection of additional specimens, Kuhlmann (1953) reinforced Sleumer's claims, pointing out that *N. kuhlmannii* was 4-merous and had flowers disposed in a racemose inflorescence. Kuhlmann did not mention anther shape. These characteristics matched those of the described species of *Neosprucea* and were unlike those of *Banara*.

In 1978, however, Sleumer transferred the species to *Banara* without comment, presumably because he had then seen flowers and realized that the globose to ellipsoidal shape of the anthers was characteristic of *Banara*, not *Neosprucea*. Sleumer (1980) maintained this treatment of the species as *Banara kuhlmannii* (Sleumer) Sleumer in his monograph of the Neotropical Flacourtiaceae.

The first specimen of *Banara kuhlmannii* that I examined (*A. M. de Carvalho et al. 6689*, MO) was annotated by Ron Liesner in 2000 as "If Flacourtiaceae, new genus! To me it looks like a Flacourt! Need fls [flowers]." Although the species had already been described, his intuition was correct. The species has several characters atypical of either *Banara* or *Neosprucea*. The glandular apices of the leaf teeth are papillate (violoid) instead of spherulate (salicoid) or torus-shaped (see Leaf Architecture Working Group, 1999; Hickey & Wolfe, 1975; Alford, 2005), and it has receptacular disk glands and a perianth that is deciduous after anthesis. This combination of characteristics is indicative of *Ahernia* and *Pleuranthodendron*. Because this species differs in several key characters from those other genera (see description and key below), a new genus is erected here. Another possibility is to lump all three entities into *Ahernia*, the name with priority, but because their interrelationships are still unresolved (Alford, 2005) and because *Pleuranthodendron* is a relatively common genus of the Neotropics, the more conservative and less disruptive approach is the creation of a new genus.

Macrothumia M. H. Alford, gen. nov. TYPE: *Macrothumia kuhlmannii* (Sleumer) M. H. Alford. Figure 1.

Genus novum, *Iherniae* Merrill affine, a qua fructibus majoribus et numero petalorum differt, et *Pleuranthodendro* L. O. Williams affine, a quo inflorescentia haud ramosa et numero seminum et tepalorum differt. Arbor, folia simplicia, alterna, ovata vel oblongo-elliptica, ad apicem petioli glandulis duabus rotundis crassis operculatis instructa, margine inconspicue serrato, venatione foliorum actinodroma. Inflorescentia terminalis racemosa fasciculatiformis vel umbelliformis, sepala et petala 3 vel 4, post anthesin decidua, stamina numerosa, antherae ellipsoideae, glandulae disci praesentes, ovarium superum. Capsula globosa, 3–5 cm diametro, multiseminata, pseudo-8–9-locularis, placentibus 8–9-lamelliformibus, in cavitatem profunde prominentibus, pericarpio fragili subcoriaceo.

Trees to 20 m tall, 30 cm DBH. Leaves simple, alternate, ovate to oblong-elliptic, 6–13 × 3–8 cm, apex acute to shortly acuminate, base rounded to subcordate, chartaceous, deciduous, margin subentire to inconspicuously serrate with papillate apices of the teeth, venation actinodromous, petiole 2–1.5 cm long, apex of petiole bearing a pair of thick, projecting, cup-shaped glands. Inflorescence a terminal, congested, fascicle- or umbel-like raceme of 3 to 9 flowers; sepals and petals 3 or 4, creamy yellow, ca. 1 cm long, deciduous in fruit; stamens numerous (ca. 100 to 130), anthers ellipsoidal, longitudinally dehiscent; disk glands present, consisting of a single whorl of 6 to 8(to 9) pad-like or crateriform disks, ca. 1 mm diam., with stamens arising inside, outside, and between the glands; ovary superior; style 1; stigma consisting of several minute craters at the apex of the abruptly expanded style. Infructescence of few fruits, often consisting of only 1. Capsule globose, 3–5 cm diam., multiseeded, with 8 or 9 highly intruded parietal placentae, fruit wall subcoriaceous but brittle, base of style persistent. Seeds exarillate.

Macrothumia is a new genus allied to *Ahernia* and *Pleuranthodendron*. *Macrothumia* has parietal placentation, congested, fascicle- or umbel-like racemes, three or four petals per flower, and large fruits

Figure 1. *Macrothumia kuhlmannii*. —A, C. Flowering branches. —B. Leaf, with close-ups of teeth and glands at the apex of the petiole. —D. Floral bud. —E. Flowers at anthesis. —F. Longitudinal section and cross section of a flower showing receptacular disk glands. —G. Stamens. —H. Pistil, close-up of stigma, and cross section of ovary, showing highly intruded parietal placentation. —I. Mature fruit. Scale bar equals 3 cm for A–C and I, 5 mm for E and F, and 3 mm for G and H. Length of D equals 1.3 cm. A, B, D, F, G, and H drawn from *Mori et al. 10641* (NY, herbarium sheet, spirit collection, and photos), C and E from *Thomas et al. 12530* (NY, herbarium sheet and photos), and I from *Pirani et al. 3384* (NY).

(> 3 cm diam.) with many seeds, whereas *Ahernia* has 10 to 15 petals per flower and smaller fruits (< 2.5 cm long), and *Pleuranthodendron* has large disorganized panicles and one seed per fruit.

Etymology. *Macrothumia* (μακροθυμία [f.]) is a Greek word for long-suffering or enduring patience, a virtue prized by taxonomists.

Macrothumia kuhlmannii (Sleumer) M. H. Alford, comb. nov. Basionym: *Neosprucea kuhlmannii* Sleumer, Lilloa 23: 248. 1950. *Banara kuhlmannii* (Sleumer) Sleumer, Blumea 24: 118. 1978. TYPE: Brazil. Espírito Santo: Colatino, Rio Doce, 30 Nov. 1943, *J. G. Kuhlmann 6559* (holotype, RB not seen; isotypes, LIL not seen, RB photo at USMS).

Distribution. Brazil (Bahia, Espírito Santo, Minas Gerais).

Representative specimens examined. BRAZIL. **Bahia:** *Belém & Pinheiro 2878* (NY), *Carvalho et al. 6689* (MO), *Mori et al. 10640, 10641* (NY), *Mori & Thompson 11016* (NY), *Thomas et al. 7063* (NY), *Thomas et al. 12530* (MO, NY). **Espírito Santo:** *Kuhlmann 6119* (FSU), *Pirani et al. 3384* (NY). **Minas Gerais:** *Mexia 5291* (BM, NY).

A thorough description of the species may be found in Sleumer (1980), as *Banara kuhlmannii*, although he failed to mention the key character of receptacular disk glands and reported, with the material at his disposal, that the flowers were 3-merous (or rarely 1-merous by splitting of the petals) instead of 3- or 4-merous. Information about the use of *Macrothumia kuhlmannii* as refreshment for both humans and wildlife may be found in Kuhlmann (1953).

KEY TO THE GENERA OF SALICACEAE WITH LEAVES 3-VEINED FROM THE BASE, PAPILLATE (VIOLOID) LEAF TEETH (*NOT* SPHEROIDAL OR TORUS-SHAPED), AND PAIRED GLANDS AT THE BASE OF THE LAMINA OR APEX OF THE PETIOLE

1a. Placentation axile, or parietal with later development of a pseudo-axis ("pseudoaxile"); perianth persistent in fruit; a pair of elliptic leaf glands embedded in the base of the lamina (see photo in Alford, 2003) . . . . . *Hasseltia*

1b. Placentation parietal; perianth deciduous in fruit; a pair of circular leaf glands projecting from the lamina-petiole junction or apex of the petiole (see photo in Alford, 2003).

2a. Inflorescence a panicle; seed(s) 1(or 2) per fruit . . . . . *Pleuranthodendron*

2b. Inflorescence a raceme, this sometimes congested and fascicle- or umbel-like; seeds per fruit numerous.

3a. Raceme terminal, congested and fascicle- or umbel-like; fruit large, spherical (> 3 cm diam.); petals 3 or 1; Brazil . . . . . *Macrothumia*

3b. Raceme axillary, not congested; fruit small, obovoid to ellipsoid (< 2.5 cm long); petals 10 to 15; Philippines . . . *Ahernia*

ABATIA AND APHAEREMA

Abatia, *Aphaerema*, *Pseudoscolopia* Gilg, and *Homalium* Jacquin are the only genera in Salicaceae that have opposite leaves. *Aphaerema* and *Abatia* are closely related Neotropical genera. *Pseudoscolopia* is a South African genus of a different tribe, and *Homalium* is a pantropical genus of a different tribe with only a few species from Madagascar that have opposite or whorled leaves. *Aphaerema* is a monotypic genus from Brazil and Argentina of small shrubs (< 0.5 m) with 8(to 12) stamens and no staminodes (Angely, 1962). *Abatia* is a genus of nine montane species from Mexico and Central and South America of small- to medium-sized shrubs (to 4 m tall) commonly with numerous stamens (ca. 20 to 35) and an outer ring of filamentous staminodes. Baillon (1872) noted that two new species of *Abatia*, since described as *A. stellata* Lillo (1919) and *A. mexicana* Standley (1931), have as few stamens (4 to 8) as *Aphaerema*. Baillon (1872) considered the genera closely related and did not believe that the absence of staminodes was alone sufficient for generic status. Thus, he treated *Aphaerema* as part of *Abatia*. Furthermore, several other species of *Abatia*, *A. americana* (Gardner) Eichler, *A. glabra* Sleumer, and *A. microphylla* Taubert, have intermediate numbers of stamens (12 to 20) and form an overall morphological continuum between the larger, common species of *Abatia* with numerous stamens and staminodes and the diminutive *Aphaerema* with few stamens and no staminodes. Despite the clear continuity between *Aphaerema* and *Abatia*, their segregation has been maintained, with some authors producing dichotomous keys with number of stamens as a principal character, presumably unaware of the less common species or their characters (e.g., Hutchinson, 1967). Further evidence of their close relationship has been inferred from analyses of plastid DNA (Alford, 2005).

Although considering the two genera congeneric, Baillon (1872, 1875, 1876) never made the proper transfer of *Aphaerema* to *Abatia*, because he did not associate the epithet of *Aphaerema spicata* Miers with *Abatia* (ICBN Art. 33.1, Greuter et al., 2000). *Aphaerema spicata* is thus transferred formally to *Abatia* here, but because that epithet is blocked in *Abatia* by *Abatia spicata* (Turczaninow) Sleumer, a substitute name is introduced (cf. ICBN Art. 11.2 11.4, Greuter et al., 2000).

Abatia angeliana M. H. Alford, nom. nov. Replaced name: *Aphaerema spicata* Miers, Proc. Roy. Hort.

Soc. London 3: 295. 1863. TYPE: Brazil. Paraná: São Jerônimo da Serra, 1861, *J. Weir 427* (lectotype, designated here, K 000187414; duplicates, BM, K).

A lectotype is chosen because Miers did not designate a holotype. He referred to a single collection in the protologue, *J. Weir 427*, of which one specimen exists at BM and two at K. Thus, the three specimens are syntypes. All specimens are of excellent quality, and the particular specimen at K is chosen due to the amount of material available on the sheet.

Etymology. The epithet honors João Alberto Angely (1917–), Brazilian botanist and editor of the small and short-lived series *Flacourtiaceae: Série científica devotada ao estudo geral das plantas desta família.*

Key to the Genera of Salicaceae with Opposite or Whorled Leaves

1a. Receptacular disk glands present; stamens often in fascicles opposite petals; ovary half-inferior . . . . . *Homalium*

1b. Receptacular disk glands absent; stamens never in fascicles opposite petals; ovary superior.

2a. Petals absent; inflorescence a many-flowered raceme; style not parted at apex; New World . . . . . *Abatia*

2b. Petals present; inflorescence a few-flowered cyme; style 2- or 3-parted at apex; South Africa . . . . . *Pseudoscolopia*

Priamosia

The monotypic genus *Priamosia* Urban from Hispaniola was described in 1919. Urban suggested that it is allied with *Xylosma* and perhaps *Azara* Ruiz & Pavón, genera that also have axillary inflorescences, receptacular disk glands (lacking in some *Azara*), and no petals, characteristics typical of the tribe Flacourtieae (cf. Warburg, 1893; Gilg, 1925; Lemke, 1988). Urban (1919) pointed out that *Azara* differs from *Priamosia* in having leaf-like stipules and that *Xylosma* differs from *Priamosia* in having more stamens. *Xylosma* has eight to numerous (ca. 50) stamens, while *Priamosia* has only four (Sleumer, 1980). *Priamosia* and *Xylosma* are also usually dioecious and have armed branches, while *Azara* is usually bisexual and never armed (Sleumer, 1980). Sleumer (1980) and Liogier (1981) further recorded that *Priamosia* has stipules while *Xylosma* does not, but this is inaccurate. Although leaf-like or scale-like stipules do not occur in *Xylosma*, except perhaps in the short shoots of *Xylosma bahamense* (Britton) Standley, stipules essentially reduced to single glands do occur in numerous species (Alford, pers. obs.). Because stipules of Salicaceae are sometimes glandular toothed, a gland in a stipule's position is probably the simple reduction of the laminar part of the stipule, leaving only the terminal tooth. A similar phenomenon has been observed in *Azara* (Charlton, 1994). The one reliable character differentiating *Xylosma* and *Priamosia* is stamen number.

Urban and Ekman in Urban (1930) later described *Xylosma microphyllum* Urban & Ekman based on a sterile specimen. This species turned out to be a synonym of *Priamosia domingensis* Urban, indicating that the morphological similarity between *Xylosma* and *Priamosia* could confuse even the botanist who described *Priamosia*. Later authors, including Barker and Dardeau (1930), Sleumer (1980), and Liogier (1981), have maintained the segregation of the genera, but Sleumer (1980: 127) recognized that *Priamosia* is "very close to *Xylosma*." Female or sterile specimens of *Priamosia domingensis* are virtually indistinguishable from *Xylosma*, and analyses of plastid DNA data place it clearly within that genus (Alford, 2005). Because *Priamosia* was distinguished based on one unreliable character (stipule presence) and a single reliable character (stamen number, 4), which is highly variable, albeit not overlapping, in the closely related genus *Xylosma* (8 to numerous [ca. 50] stamens), there is no clear reason to maintain the two genera. Thus, I propose the transfer of *Priamosia* to *Xylosma*, and the needed combination is provided here.

Xylosma domingensis (Urban) M. H. Alford, comb. nov. *Priamosia domingensis* Urban, Repert. Spec. Nov. Regni Veg. 15: 412. 1919. TYPE: Hispaniola [Dominican Republic]. Civ. Santo Domingo: Cordillera Central, prov. de la Vega, Constanza, hillsides, pastures, thickets, ca. 1200 m, very common, 10 Nov. 1949, *E. L. Ekman H14082* (neotype, designated here, NY; duplicates, A not seen, F not seen, G not seen, GH not seen, K not seen, LL not seen, S, US not seen).

Xylosma microphyllum Urban & Ekman, Ark. Bot. 23A(5): 88. 1930. TYPE: Haiti. Massif des Cahos prope Las Caobas ad Chapelle Ste.-Claire solo detritu calcario obtecto cr. 850 m alt., *E. L. Ekman H5546* (holotype, S 01-192; isotype, S 05-961).

A neotype is designated because the holotype (*H. Eggers 2285*, B†) was destroyed in World War II. Photos of the holotype exist at F and NY, but no isotypes have been found. Very few quality specimens of *Xylosma domingensis* exist, but *Ekman H14082* (NY) was chosen as neotype because the collection comes from the same area as the holotype ("Valle de Constanza") and has numerous duplicates.

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Literature Cited

Alford, M. H. 2003. Claves para los géneros de Flacourtiaceae de Perú y del Nuevo Mundo. Arnaldoa 10: 19–38.

———. 2005. Systematic studies in Flacourtiaceae. Ph.D. Dissertation. Cornell University, Ithaca, New York.

Angely, J. 1962. Flacourtiaceae do Brasil meridional. Estudo e revisão do gênero *Aphaerema*. Delimitação de sua área geográfica na América do Sul. Flacourtiaceae 6: 1–4.

Baillon, H. E. 1872. Notes sur les Bixacées. Adansonia 10: 248–260.

———. 1875. The Natural History of Plants. Vol. IV. Reeve, London.

———. 1876. Dictionnaire de Botanique. Vol. I. Hachette, Paris.

Barker, H. D. & W. S. Dardeau. 1930. Flore d'Haïti. Service Technique du Département de l'Agriculture et de L'Enseignement Professionnel, Port-au-Prince.

Charlton, W. A. 1994. Elaboration of stipular structures in *Azara serrata* R. & P. (Flacourtiaceae). Acta Bot. Neerl. 43: 373–382.

Chase, M. W., S. Zmarzty, M. D. Lledó, K. J. Wurdack, S. M. Swensen & M. F. Fay. 2002. When in doubt, put it in Flacourtiaceae: A molecular phylogenetic analysis based on plastid *rbc*L sequences. Kew Bull. 57: 141–181.

Gilg, E. 1925. Flacourtiaceae. Pp. 377–457 *in* A. Engler (editor), Die natürlichen Pflanzenfamilien, 2nd ed. Vol. 21. Duncker & Humblot, Berlin.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Hickey, L. J. & J. A. Wolfe. 1975. The bases of angiosperm phylogeny: Vegetative morphology. Ann. Missouri Bot. Gard. 62: 538–589.

Hutchinson, J. 1967. The Genera of Flowering Plants. Dicotyledones. Vol. II. Clarendon Press, Oxford.

Kuhlmann, J. G. 1953. Flacourtiacea [sic]: *Veosprucea* Sleumer n.g. Arq. Serv. Florest. 7: 3–7.

Leaf Architecture Working Group (A. Ash, B. Ellis, L. J. Hickey, K. Johnson, P. Wilf & S. Wing). 1999. Manual of Leaf Architecture: Morphological Description and Categorization of Dicotyledonous and Net-Veined Monocotyledonous Angiosperms. Smithsonian Institution, Washington, D.C.

Lemke, D. E. 1988. A synopsis of Flacourtiaceae. Aliso 12: 29–43.

Lillo, M. 1919. Reseña fitogeográfica de la provincia de Tucumán. Estud. Bot. Presentados Primera Reunión Nac. Soc. Nat. Tucumán 1916: 210–233.

Liogier, A. H. 1981. Antillean Studies I. Flora of Hispaniola: Part 1, Celastrales, Rhamnales, Malvales, Thymeleales, Violales. Phytologia Mem. 3.

Sleumer, H. O. 1936. Über die neue Flacourtiaceengattung *Spruceanthus*. Notizbl. Bot. Gart. Berlin-Dahlem 13: 362–363.

———. 1938. Die Gliederung der Flacourtiaceae-Prockiinae Gilg. Notizbl. Bot. Gart. Berlin-Dahlem 14: 45–52.

———. 1950. Algunas flacourtiáceas sudamericanas. Lilloa 23: 247–251.

———. 1978. New combinations and a new name in neotropical Flacourtiaceae. Blumea 24: 118.

———. 1980. Flacourtiaceae. Pp. 1–199 *in* C. T. Rogerson (editor), Flora Neotropica, Monograph No. 22. New York Botanical Garden, New York.

Standley, P. C. 1931. Studies of American Plants V. Publ. Field Mus. Nat. Hist., Bot. Ser. 8: 293–398.

Urban, I. 1919. LVIII. Sertum antillanum. VII. Repert. Spec. Nov. Regni Veg. 15: 397–415.

———. 1930. Flacourtiaceae. *In* Plantae Haitienses et Domingenses novae vel rariores a cl. E. L. Ekman 1924–1928 lectae. VIII. Ark. Bot. 23a(5): 82–89.

Warburg, O. 1893. Flacourtiaceae. Pp. 1–56 *in* A. Engler & K. Prantl (editors), Die natürlichen Pflanzenfamilien, Vol. 3(6a). Wilhelm Engelmann, Leipzig.

Astragalus asotinensis (Fabaceae), a Newly Discovered Species from Washington and Idaho, United States

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Abstract. *Astragalus asotinensis* Björk & Fishbein (Fabaceae) is newly described from a single population on limestone of the Limekiln Formation at the mouth of Hells Canyon in Washington and Idaho in the United States. This population of several thousand plants has yet to be found on any of the non-calcareous substrates in the vicinity. Its affinities appear closest to *Astragalus* sect. *Podosclerocarpi* A. Gray, which hitherto encompassed three species of the Columbia Basin of British Columbia, Oregon, and Washington, in northwestern North America. *Astragalus asotinensis* represents a disjunct element of section *Podosclerocarpi*, the nearest population of which, in the form of *A. sclerocarpus* A. Gray, occurs 150 km northwest. With species of section *Podosclerocarpi*, *A. asotinensis* shares a strongly cauline habit, creamy white petals, non-gibbous calyx base, and stipitate, curved fruits. It is unique within section *Podosclerocarpi* in having sparse pubescence, a much longer ratio of peduncle-to-raceme length (4:1), and an intermediate leaflet length-width ratio (5:1).

Key words: *Astragalus*, edaphic endemic, Hells Canyon, Idaho, *Podosclerocarpi*, Washington.

Astragalus sect. *Podosclerocarpi* A. Gray (Fabaceae) contains three North American species known from the Columbia River Basin of the Okanagan Valley in British Columbia south to north-central Oregon (Barneby, 1964). *Astragalus sclerocarpus* A. Gray is the most widespread of the trio, with a distribution that encompasses most of the range of the section, and is the only one that occurs outside Washington. It grows in sandy soil and dunes in arid and semiarid regions. *Astragalus speirocarpus* A. Gray is a regional endemic of sagebrush/bunchgrass steppe on hills near the Columbia and Yakima rivers, in Washington. *Astragalus sinuatus* Piper is a narrow endemic known only from steppe near the Columbia River in Chelan County, Washington.

In our exploration of Lime Hill, a large outcrop of limestone surrounded by flood basalts and other non-calcareous substrates (Reidel et al., 1992), we encountered a fourth, undescribed member of *Astragalus* sect. *Podosclerocarpi* that appears to be restricted to limestone. It is morphologically distinct and disjunct by 150 km from the nearest population of any other species of the section (*A. sclerocarpus* in Adams County, Washington).

Astragalus asotinensis Björk & Fishbein, sp. nov. TYPE: U.S.A. Washington: Asotin Co., Grande Ronde River, Lime Hill, just S of confluence with Snake River, ca. 0.75 mi. (air) SE of Rogersburg, 29 May 1999, *M. Fishbein 3922, S. McMahon, G. Allen & J. Antos* (holotype, WS; isotype, ARIZ, DAV, MO, NY, US). Figure 1.

Haec species *Astragalo sinuato* similis sed foliis sparsim strigosis, supra fere glabris (non dense cinereis pubescentibus), foliolis 15–23 (vs. 11–15) et 4–6 plo longioribus quam latioribus (vs. 2–3 plo longioribus), rachidibus foliorum 54–77 mm longis (vs. 25–40 mm), et fructibus 70°–110° curvis (vs. 45°–65°) differt.

Bushy perennial herb from thick, woody taproot, with very numerous, decumbent to ascending stems; herbage appearing green throughout; stems reaching 40–50 cm in length with strigose pubescence of relatively short hairs, 0.15–0.60 mm. Leaves pinnately compound, pubescence sparse, strigose, adaxial surface of leaflets nearly glabrous and bright green; stipules free, broadly triangular, persistent, 2.5–3.5 mm long; petiole (2–)6–7(–11) mm long; rachis 5.4–7.7 cm long, composed of 15 to 23 leaflets 3.5–7.5 times longer than broad. Inflorescences axillary, racemose; peduncle 6–10 cm long, sparsely strigose, ascending; raceme 18–45 cm long; bracts minute, narrowly triangular, persistent. Flowers 7 to 20; calyx tube 6–7.3 mm long, segments 1.5 mm long, acuminate; petals 5, creamy-white, often lightly tinged with rose or lavender especially on the keel tip; keel surpassed by the wings by ca. 3 mm, wings surpassed

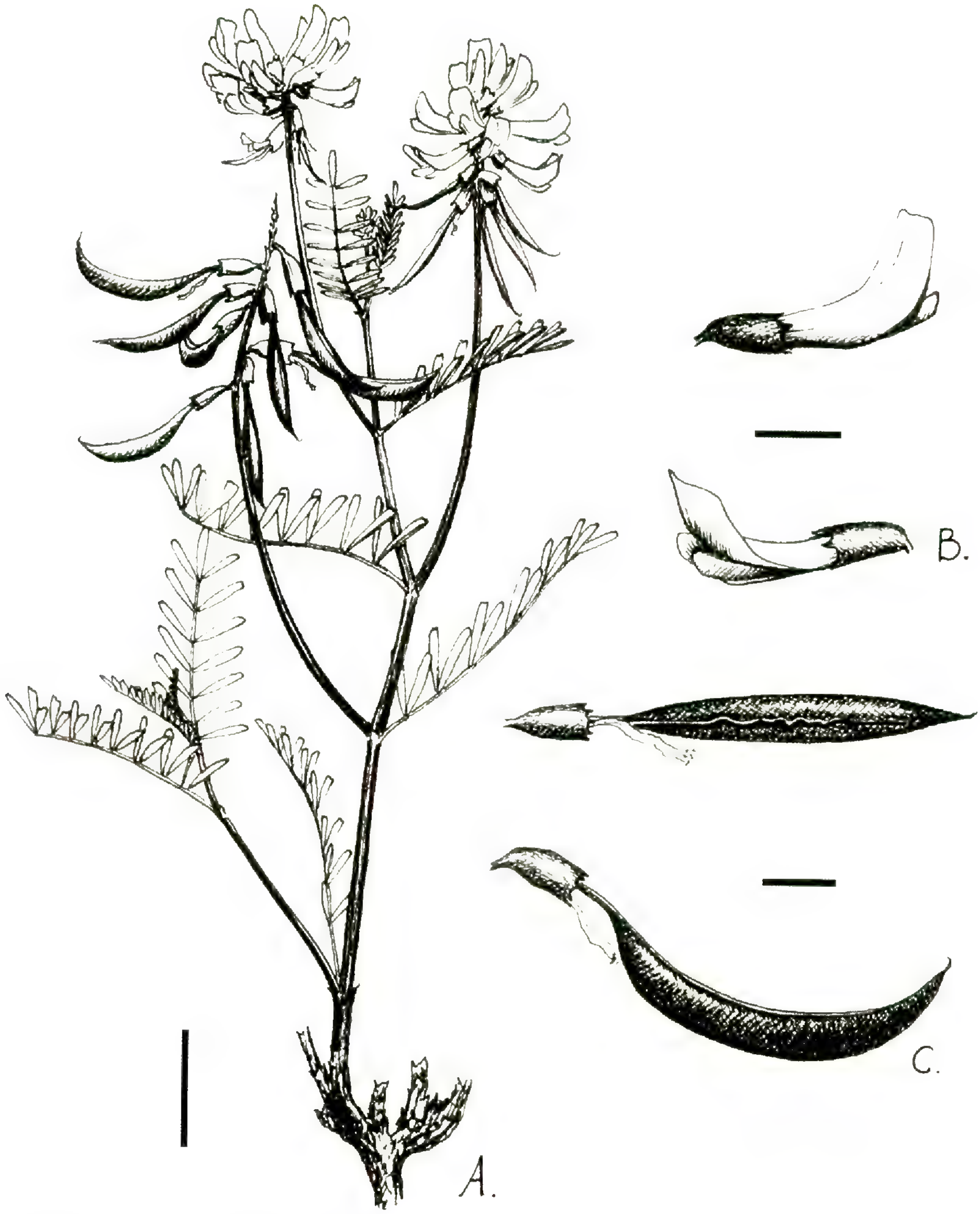

Figure 1. *Astragalus asotinensis* Björk & Fishbein. —A. Habit, with only one of multiple stems depicted. —B. Flowers in oblique lateral views. —C. Abaxial (above) and lateral (below) view of legume, showing slightly sinuous suture. Scale bars: A = 10 cm; B, C = 10 mm. Drawing by C. Björk, from *Björk 1105* (WS).

by the banner by ca. 3 mm; stamens 10; carpel 1 with superior, short-stipitate ovary, white-strigose; ovules 15 to 19. Fruit a dehiscent, stipitate legume 28–37 mm long, sparsely white strigose; at maturity spreading, curved through 70°–110°, straw-colored to reddish brown, very rigid to nearly woody, the abaxial suture straight or moderately sinuate; seeds 1 to 10, grayish brown, distorted-prismatic.

Phenology. *Astragalus asotinensis* flowers between late March and early May, and its fruits mature between early May and early June.

Etymology. *Astragalus asotinensis* receives its name from the county and region of Washington, where it was first discovered. Asotin is reportedly derived from the Nez Perce term for "Place of Eels" (Hitchman, 1985).

Species concept. We recognize the newly discovered population as a new species on the basis of a unique combination of character states, relative to others in *Astragalus* sect. *Podosclerocarpi*. Additional support for the establishment of specific status for this population comes from the vanishingly small proba-

bility of gene flow between *A. asotinensis* and other populations of the section *Podosclerocarpi*, which are disjunct by 150 km or more. Thus, recognition of *A. asotinensis* fulfills criteria of one version of the phylogenetic species concept (Nixon & Wheeler, 1990) and the biological species concept (Mayr, 1963).

Ecology and distribution. *Astragalus asotinensis* occurs as a single population of several thousand individuals limited to limestone-derived soil on the Limekiln Formation of Asotin County, Washington, and Nez Perce County, Idaho, in the northwestern United States. The exposed portions of this formation and the population of *A. asotinensis* are limited to a total area of ca. 4 km^2. We have not been able to locate any individuals of *A. asotinensis* on the flood basalts or other substrates that surround the Limekiln Formation, and thus the species appears to be an edaphic endemic. The population is situated at the northern extreme of Hells Canyon, where the Limekiln Formation constitutes the northernmost station of the Martin Bridge Formation (Reidel et al., 1992). These limestones are derived from coral reefs around islands that accreted onto the continent 300 to 130 million years ago (mya) (Vallier & Brooks, 1994). Our searches for *A. asotinensis* on other limestone outcrops in the region have been unsuccessful. The Limekiln Formation is split into roughly equal halves by the Snake River, as is the known population of *A. asotinensis*.

Astragalus asotinensis appears to favor 30°–50° slopes and is distributed evenly on all aspects. Individuals occur on moderately deep to very shallow loamy soils derived from limestone, or on loose slate slopes. It is common from 400 to 900 m, where it grows in canyon grassland. Here it is associated with the bunchgrasses *Pseudoroegneria spicata* (Pursh) Á. Löve, *Elymus wawawaiensis* J. R. Carlson & Barkworth, *Koeleria macrantha* (Ledebour) Schultes, *Festuca idahoensis* Elmer, and *Poa cusickii* Vasey, along with small shrubs such as *Gutierrezia sarothrae* (Pursh) Britton & Rusby, *Phlox colubrina* Wherry & Constance, and *Glossopetalon spinescens* A. Gray, and a large diversity of forbs. Below about 650 m elevation in the Idaho portion of the population, most potential habitat for *A. asotinensis* is dominated by non-native plants such as *Bromus tectorum* L., *Bromus rigidus* Roth, *Onopordum acanthium* L., and *Sisymbrium altissimum* L., possibly due to a history of grazing. *Astragalus asotinensis* may tolerate some anthropogenic disturbance, as evidenced by the numerous plants recolonizing abandoned jeep tracks. However, few individuals grow in the presence of heavy weed infestations.

Astragalus asotinensis is part of a noteworthy local and regional concentration of biodiversity. The Washington portion of the population and less-disturbed portions in Idaho are habitat for a very rich flora and fauna. A number of species are endemic to the shared border region of Washington, Idaho, and Oregon, including 17 of the plants that occur sympatrically with *A. asotinensis* at Lime Hill. Additionally, a land snail, *Oreohelix idahoensis washingtonensis*, is narrowly endemic to the Limekiln Formation (Pilsbry, 1948) and co-occurs with *A. asotinensis*.

Astragalus asotinensis was first collected in 1925 by Harold St. John (*3502*, WS), who attributed his collection to *A. arthuri* M. E. Jones, which is also present at Lime Hill. St. John's specimen from "mouth of Grande Ronde," which is very likely from the type locality, is actually a mixed collection of *A. arthuri* and *A. asotinensis*. The sheet consists of a complete specimen of *A. arthuri* (sect. *Miselli* (Rydberg) Barneby), including the caudex and multiple stems bearing flowers and fruits, overlain by a meager flowering stem of *A. asotinensis*. The discordant element was recognized in 1953 by R. C. Barneby, who verified the *A. arthuri* determination and annotated the single stem of *A. asotinensis* as "*A. sclerocarpus*?" Because of the lack of fruiting material and overall paucity of the collection, it is understandable that Barneby did not recognize the novelty of *A. asotinensis*. However, he was correct in associating it with section *Podosclerocarpi*.

Astragalus asotinensis differs from all others in section *Podosclerocarpi* in overall vestiture, the relative length of the peduncle to raceme, and the degree of curvature of the mature fruit, as well as the number, shape, and adaxial pubescence of the leaflets (Table 1). Other characteristics that aid in distinguishing species of this section are summarized in Table 1. Among section *Podosclerocarpi*, *A. asotinensis* is most similar to *A. sinuatus*, especially with regard to vegetative and fruit characters that best discriminate *Astragalus* species. With *A. sinuatus*, *A. asotinensis* shares a relatively leafy growth form and moderately curved legumes. However, *A. asotinensis* is readily distinguished by its sparse, strigose pubescence and numerous, narrower leaflets versus the denser, canescent pubescence and fewer, broader leaflets of *A. sinuatus*. Although the dorsal suture of the legume is often sinuous in both species, it is less frequently so in *A. asotinensis*.

Paratypes. U.S.A. **Idaho:** Nez Perce Co., lower slopes of Craig Mt. at mouth of Hells Canyon above Limekiln Rapids, *C. Björk 7684* (ID). **Washington:** Asotin Co., mouth of Grand Ronde River, *St. John 3502*, p.p. (WS); Snake River Canyon, Lime Hill, just E of confluence with Grande Ronde

Table 1. Distinguishing features of *Astragalus asotinensis*, *A. sclerocarpus*, *A. sinuatus*, and *A. speirocarpus*. The range (mean in parentheses) is reported for each quantitative character. See *Paratypes* and *Additional specimens examined* for the list of specimens on which these characters were observed.

Character	*A. asotinensis*	*A. sclerocarpus*	*A. sinuatus*	*A. speirocarpus*
Vestiture of stems and leaves	trichomes short (ca. half the length of other sect. *Podosclerocarpi*), strigose, appressed, sparse; herbage appearing green; leaf upper surface nearly glabrous	trichomes dense, appressed; herbage gray-canescent	trichomes dense, many spreading; herbage gray-canescent	trichomes dense, appressed to ascending; herbage gray-canescent
Stem length (cm)	7–52 (14)	33–50 (42)	30–33 (31)	16–28 (24)
Leaf rachis length (mm)	54–77 (60)	60–82 (72)	25–40 (33)	37–57 (49)
Leaflet length:width ratio	3.5–7.5 (5.1)	7.1–8.9 (8)	2.6–2.9 (2.8)	2.7–4.1 (3.1)
Leaflet number	15–23 (19)	9–13 (11)	11–15 (13)	13–17 (15)
Stipule length (mm)	1.7–3.3 (2.9)	2.7–3.4 (3)	2–3 (2.8)	1.3–1.6 (1.4)
Peduncle:raceme length ratio	3.2–5.2 (4.2)	1.6–2.3 (2.1)	1.7–1.9 (1.8)	1.0–1.7 (1.3)
Legume vestiture	moderately sparse	dense	sparse, mostly along sutures	dense
Legume stipe length (mm)	6–11 (8)	7–23 (15)	6–8 (7)	5–7.5 (6.5)
Legume width (mm)	3–3.5 (3.3)	5.5–8.5 (6.5)	3–6 (4.5)	2.5–4 (3)
Legume curvature (degrees)	40–118 (89)	5–43 (18)	43–68 (51)	480–542 (504)
Legume abaxial suture	straight or sinuate	straight or occasionally sinuate	usually sinuate	straight

Riv., ca. 1 mi. (air) SE of Rogersburg, NW-facing steep slope, *M. Fishbein 3855* (ARIZ, DAV, NY, WS); Lime Hill, W-facing limestone slope, *M. Fishbein 3898* (ARIZ, GH, HPSU, ID, MO, NY, OSC, UC, UTC, WS, WTU); top of Lime Hill, 1.5 mi. (air) SE of Rogersburg, ridge top, *M. Fishbein 3901* (NY, WS); Lime Hill, W-facing limestone slope, *M. Fishbein 3902* (NY, WS); N side of Lime Hill, 1.4 mi. (air) ESE of mouth of Grande Ronde Riv., *C. Björk 1120* (ID, WS, WTU); SE slopes of Lime Hill, 1.6 mi. (air) ESE of mouth of Grande Ronde Riv., *C. Björk 1136* (WS); N slopes of Lime Hill, 1.5 mi. (air) SE of mouth of Grande Ronde Riv., *C. Björk 1405* (OSC, UBC, WS).

Additional specimens examined.

***A. sclerocarpus*: U.S.A. Oregon:** Gilliam/Sherman Co., mouth of John Day Riv., *C. Hitchcock 20431* (WS). **Washington:** Adams Co., 8 mi. N of Kahlotus, *L. Constance 1156* (WS); Benton Co., White Bluffs, Hanford Nuclear Res., 1 May 1984, *R. Angelin s.n.* (WS); 3 mi. S of Hanford, *C. Hitchcock 8181* (WS), *J. Langham 183* (WS); Franklin Co., Pasco, *C. Parker 319* (WS); Grant Co., 0.5 mi. S of W end of O'Sullivan Dam, *S. Harris 62* (WS); 1 mi. W of O'Sullivan Dam, *C. Hitchcock 21867* (WS); 17.25 mi. ESE of Mattawa?, *R. & D. Naas 3999* (WS); jct. of Crab & Wilson Creeks, *Sandberg & Leiberg 312* (WS); Kittitas Co., Ellensburg, May 1896, *H. Hindshaw s.n.* (WS); Klickitat Co.?, Carly to Roosevelt, *F. Pickett 1422* (WS); Walla Walla Co., 2 mi. SW of Attalia, *R. Beattie 3920a* (WS); Wallula, *J. Cotton 1013* (WS).

***A. sinuatus*: Washington:** Washington Terr., *T. S. Brandegee 729* (GH, isotype); Chelan Co., Colockum Creek, 5 mi. from Columbia Riv., *G. Ward 261* (WS); Colockum Creek, 2 mi. from Columbia Riv., *R. & M. Spellenberg 1944* (WS).

***A. speirocarpus*: Washington:** Grant/Kittitas/Yakima Co., Priest Rapids, *J. Mastrogiuseppe 1337* (WS); Kittitas Co., 6 mi. W of Vantage, *R. Daubenmire 5411* (WS), 16 May 1965, *E. Lindgren s.n.* (WS); 7 mi. S of Ellensburg, *C. Hitchcock 22316* (WS); Vantage, *J. Thompson 11139* (WS); Ginkgo State Park, *J. Mastrogiuseppe 1311* (WS); Klickitat Co., Columbia River opposite Alkali, 17 May 1882, *T. J. Howell s.n.* (WS); Yakima Co., Satus Creek, 21 mi. S of Toppenish, *A. Grable 6105* (WS); 20 mi. N of Satus Pass, *C. Hitchcock 3331* (WS); 5 mi. N of Selah, *C. Hitchcock 20173* (WS); Yakima, 12 May 1898, *A. Lackenby s.n.* (WS); Pomona, *E. Nelson 1662* (WS); Horse Heaven Hills S of Toppenish, *J. Witt 1935* (WS).

KEY TO THE SPECIES OF *ASTRAGALUS* SECT. *PODOSCLEROCARPI* (modified from Barneby, 1964)

1a. Pubescence of the calyx and leaflets mostly straight and appressed; leaflets linear or narrowly oblong (l:w = 3–9).

2a. Pubescence dense, plants gray-canescent, but becoming greener with age, longest trichomes > 0.5 mm; leaflets 9 to 13, linear (l:w = 7.1–8.9); body of the legume obliquely or falcately ellipsoid, 6–9 mm high, nearly straight to incurved through 15°; open, sandy habitats; Columbia Basin, from southern British Columbia, through central Washington, to extreme northern Oregon. . . *A. sclerocarpus* A. Gray

2b. Pubescence sparse, plants green, longest trichomes < 0.5 mm; leaflets 15 to 23, oblong to narrowly oblong (l:w = 3.5–7.5); body of the legume linear-oblong, 3–3.5 mm high, incurved 70°–110°; grassland; Asotin County in extreme southeastern Washington and adjacent Nez Perce County, Idaho. . . . . *A. asotinensis* Björk & Fishbein

1b. Pubescence of the calyx and leaflets incumbent or curly; leaflets oblong, obovate-cuneate, or cuneate-obcordate (l:w = 2.6–4.1).
3a. Peduncles mostly 2–5 cm long; pedicels in fruit 1–2.5 mm long; body of the legume tightly coiled (or equivalently contorted) through 1.25–2.5 circles; Kittitas, Yakima, Benton, and Klickitat Counties in central Washington . . . . . *A. speirocarpus* A. Gray
3b. Peduncles mostly 4.5–12 cm long; pedicels in fruit 2.7–3.5 mm long; body of the legume gently lunate- or hamate-incurved; very local, rare species of Chelan County in central Washington . . . . . *A. sinuatus* Piper

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Literature Cited

Barneby, R. C. 1964. Atlas of North American *Astragalus*. Mem. New York Bot. Gard. 13: 1–1188.

Hitchman, R. 1985. Place Names of Washington. Washington State Historic Society, Tacoma, Washington.

Mayr, E. 1963. Animal Species and Evolution. Harvard Univ. Press/Belknap Press, Cambridge, Massachusetts.

Nixon, K. C. & Q. D. Wheeler. 1990. An amplification of the phylogenetic species concept. Cladistics 6: 211–223.

Pilsbry, H. A. 1948. Pp. 412–512 *in* Land Mollusca of North America (North of Mexico). Monogr. Acad. Nat. Sci. Philadelphia, Part 3.

Reidel, S. P., P. R. Hooper, G. D. Webster & V. E. Camp. 1992. Geologic Map of Southeastern Asotin County, Washington. Geologic Map 6M-40. Washington Division of Geology and Earth Resources, Olympia, Washington.

Vallier, T. L. & H. C. Brooks (editors). 1994. Geology of the Blue Mountains Region of Oregon, Idaho and Washington: Stratigraphy, Physiography and Mineral Resources of the Blue Mountain Region. Professional Paper 1439. United States Geological Survey, Washington, DC.

Taxonomic Remarks on the *Anthyllis hermanniae* L. (Fabaceae, Faboideae) Species Complex of the Mediterranean Flora

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Abstract. Taxonomic revision of the populations belonging to the *Anthyllis hermanniae* L. species complex (Fabaceae, Faboideae) of the Mediterranean flora is given. Two distinct species are recognized: *A. hystrix* (Willkomm ex Barceló) Cardona, Contandriopoulos & Sierra, restricted to Minorca (Balearic Islands), and *A. hermanniae*, widespread in the central and eastern Mediterranean area. Within *A. hermanniae*, seven new subspecies are recognized: subspecies *hermanniae* (northeastern Mediterranean area), subspecies *melitensis* (Maltese Archipelago, Malta), subspecies *sicula* (Italy, Sicily), subspecies *brutia* (Italy, Calabria), subspecies *japygica* (Italy, Apulia), subspecies *ichnusae* (Italy, Sardinia), and subspecies *corsica* (France, Corsica). Each of these new taxa is described and illustrated. A key of the surveyed taxa is provided.

Key words: *Anthyllis hermanniae*, Fabaceae, IUCN Conservation Status, Mediterranean.

According to the literature (Cullen, 1968; Runemark, 1969; Browicz, 1978; Pignatti, 1982; Benedi, 2000), *Anthyllis hermanniae* L. (Fabaceae, Faboideae) is a small shrub distributed mainly in the northeastern Mediterranean area, with some disjunct ranges, sometimes punctiform, in the central and western Mediterranean region. The taxon occurs on various substrata, such as limestone, dolomite, volcanic rock, granite, schist, gneiss, calcarenite, and marl, from sea level to 2400 m.

Field and herbarium investigations demonstrate that the eastern populations are quite homogeneous, while those from the central and western Mediterranean region show a remarkable morphological and ecological variability. Therefore, *Anthyllis hermanniae* is considered a species complex, with scattered and well-differentiated populations whose taxonomic status needs to be clarified.

In this framework, we did an intensive study of this group carried out chiefly on living material cultivated in the Botanical Garden of Catania, Italy. In particular, we examined specimens from Corsica, Sardinia, Sicily, Malta, Calabria, and Apulia, as well as those occurring in the Balearic Islands, Balkan Peninsula, Anatolia, and the Aegean Islands.

Cardona and Contandriopoulos (1983) and Cardona et al. (1986) consider *Anthyllis hystrix* (Willkomm ex Barceló) Cardona, Contandriopoulos & Sierra, with a population restricted to the Balearic Islands, to be a distinct species well differentiated by its morphology and karyology. *Anthyllis hystrix* has been previously treated as a variety or subspecies of *A. hermanniae* (Barceló i Combis, 1880; Bolòs & Vigo, 1974). It clearly differs from the other allopatric populations of *A. hermanniae* by having a thorny pulvinate habit, simple leaves, small solitary flowers (max. 5 mm), and a hexaploid chromosome complement (Cardona & Contandriopoulos, 1983). In contrast, *A. hermanniae* is a laxly subspinescent shrub, with leaves 1- to 5-foliolate, larger flowers (6–11 mm) in fascicles of 2 to 6, and a diploid chromosome complement (Cardona & Contandriopoulos, 1983).

Within other Mediterranean populations of *Anthyllis hermanniae*, further morphological differences, principally in the shape and the size of the flowers, have been observed. Based on these characters, the eastern Mediterranean populations (i.e., Montenegro, Albania, Greece, Crete, Turkey) correspond to the Linnean type for the species, while those of the central Mediterranean show marked heterogeneity. In particular, it is possible to recognize taxa corresponding to those populations occurring in Corsica, Sardinia, Sicily, Malta, Calabria, and Apulia. Due to the long geographic isolation, all these populations may be considered as schizoendemics, and therefore they are treated here as subspecies of *Anthyllis hermanniae*.

1. **Anthyllis hystrix** (Willkomm ex Barceló) Cardona, Contandriopoulos & Sierra, Taxon 32: 324. 1983. Basionym: *Anthyllis hermanniae* L. var. *hystrix* Willkomm ex Barceló, Fl. Bal.: 112. 1880. *Anthyllis hermanniae* L. subsp. *hystrix* (Willkomm ex Barceló) O. Bolòs & Vigo, Butl. Inst. Catalana Hist. Nat., Secc. Bot. 38: 71. 1974. TYPE: [Spain, Balearic Islands: Minorca] "planta frequentissima est in locis si laurentii eundo ad montem tauri, insula balear. minoris, cult. Varia," *Salvador s.n.* (lectotype, designated by Cardona et al. (1986: 22), BC-Salvador).

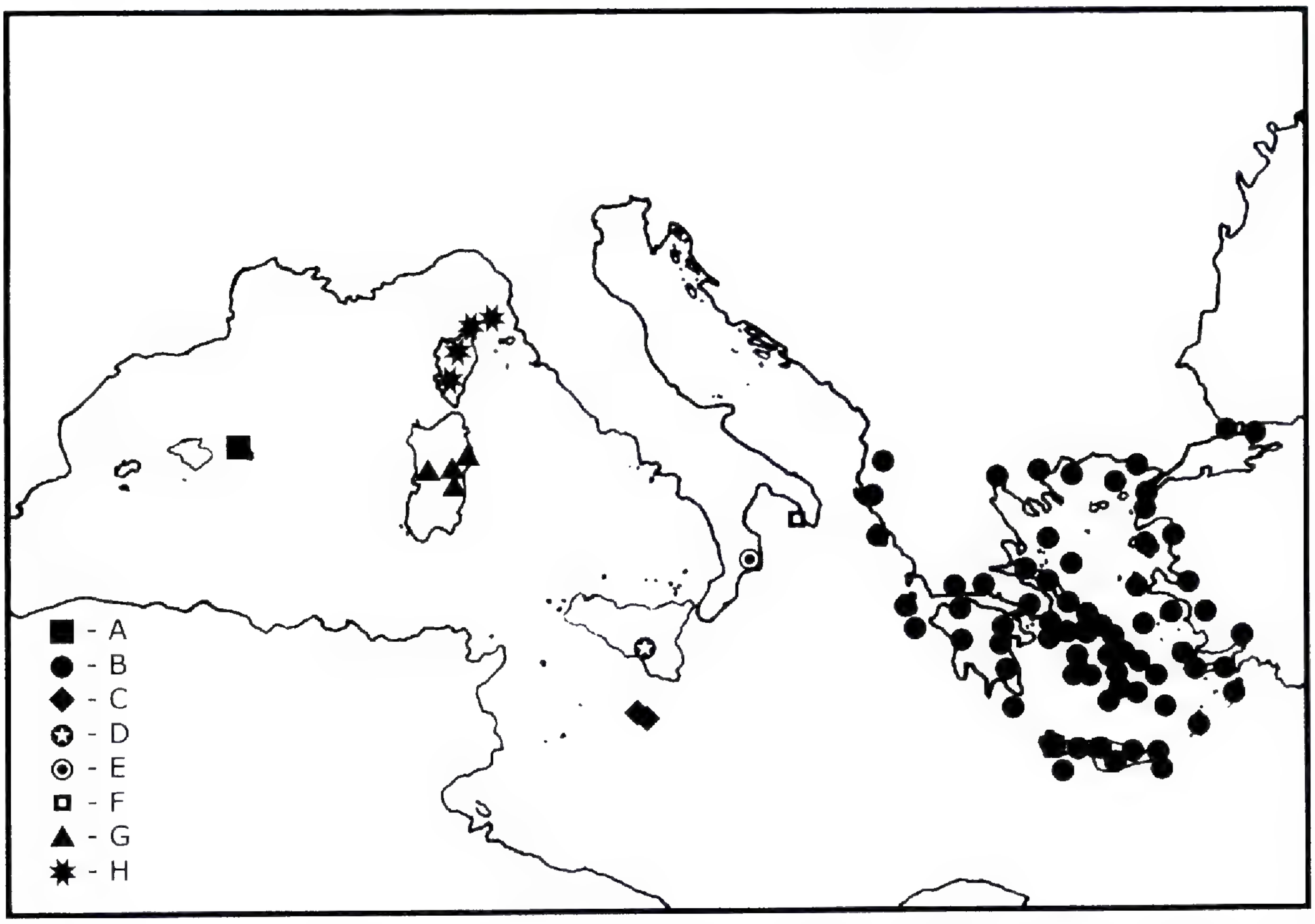

Figure 1. Geographic distribution of —A. *Anthyllis hystrix*. —B. *Anthyllis hermanniae* subsp. *hermanniae*. —C. *A. hermanniae* subsp. *melitensis*. —D. *A. hermanniae* subsp. *sicula*. —E. *A. hermanniae* subsp. *brutia*. —F. *A. hermanniae* subsp. *japygica*. —G. *A. hermanniae* subsp. *ichnusae*. —H. *A. hermanniae* subsp. *corsica*.

Thorny pulvinate shrub, 25–50 cm tall, with tortuous woody branches densely spiny, terminally aphyllous, pubescent to subglabrous. Leaves simple, rarely 3-foliolate, linear-lanceolate, acute, generally inserted on brachyphylls of imbricate, semi-amplexicaul leaf sheaths. Flowers solitary, rarely in fascicles of 2 flowers, shortly pedicellate, inserted in axil of foliaceous bract. Calyx sericeous, campanulate, bilabiate, 1.8–3 mm long, with teeth triangular, subequal, 1/4 tube length; corolla yellow, standard rounded at apex, 4–5 mm, wings 3.5–4 mm, keel 3–3.5 mm, staminal tube 3–3.5 mm, pistil 3–3.5 mm, many-ovuled, stigma globose. Legume 3–3.5 mm long, 1-seeded, obovate, laterally slightly compressed, veined and exserted from the calyx.

Habitat and distribution. According to Cardona et al. (1986), this species grows exclusively on calcareous or siliceous rocks, along the coastline of Minorca in the Balearic Islands, Spain (Fig. 1). It is localized within subhalophilous communities of the Crithmo-Limonietea class according to the classification of Braun-Blanquet (Braun-Blanquet et al., 1952). More rarely, it is found at higher altitude stands within the thorny pulvinate vegetation identified as Rosmarinetea officinalis class in Rivas-Martínez et al. (2002).

Phenology. Flowering April to May; fruiting May to June.

Chromosome number. $2n = 84$ (Cardona & Contandriopoulos, 1983; Cardona et al., 1986).

Conservation status. LC (IUCN, 2001, 2003).

Populations belonging to this species are the westernmost of the *Anthyllis hermanniae* group. Due to the long geographic isolation, likely to have begun in the Tertiary, the populations of *A. hystrix* are well differentiated based on their karyology. An iconography of this species has been issued by Cardona et al. (1986, figs. 1, 2, 3).

Additional specimens examined. SPAIN. **Balearic Islands:** "Balearium, Insula Minore, in rupestribus maritimi inter Fornels et Pinon de l'Anticrist, sol. calcar., Aug. 1885." *Porta & Rigo s.n.* (B, FI, G, W); "in pascuis petrosis maritimis prope pagum Fornello, 6 Jul. 1875." *Porta & Rigo s.n.* (B, W); "in pascuis saxosis maritimis circa Fornels et inter Fornels et Cabo Caballeria, 8 May–6 Jul. 1885." *Porta & Rigo s.n.* (NAP); "Minorca, in sabulosis pentibus, 1876." *Rodriguez s.n.* (W); "Minorca, Cabellina." *Kennedy 52* (B); "Minorca, playa de Cabo Caballeria, 13 Jun. 1980." *Castroviejo, Lopez, Regueiro, Valdes-Belmejo s.n.* (W); "Menorca: plagie de Cala Mica, sur sables." *Charpin & Massar 19248* (G).

2. Anthyllis hermanniae L., Sp. Pl. 2: 720. 1753. TYPE: Greece, "Habitat in Graecia" (lectotype, designated by Turland & Jarvis (1997: 463), LINN 897/14).

2a. Anthyllis hermanniae subsp. **hermanniae**. Figures $2A_1$–A_3, $3A_1$–A_3.

Shrub 40–70 cm tall, with woody branches, intricate and tortuous, laxly spiny, sometimes subspinescent, pubescent to subglabrous. Leaves 1- to 3-foliolate, rarely 5-foliolate, with middle leaflet larger than the lateral ones, spathulate to oblanceolate, obtuse, somewhat obtuse or slightly retuse at apex, sometimes shortly mucronate, rarely inserted on brachyphylls made of imbricate, semi-amplexicaul leaf sheaths. Flowers in fascicles of 2 to 6, rarely solitary, shortly pedicellate, inserted at axil of a foliaceous bract. Calyx sericeous, tubular, bilabiate, 3.2–4.5 mm long, with teeth triangular, unequal, the upper ones curved, 1.2–2 mm, the lower ones straight or slightly curved, 0.9–1.5 mm; corolla yellow, standard retuse at apex, 5.8–7 mm long, with claw 2.2–2.5 mm and limb 3.8–4 × 3.2–3.8 mm, wings 5.4–6.2 mm, with claw 2–2.6 mm and limb 3.4–3.6 × 1.1–1.3 mm, keel 5–5.5 mm, with claws 2–2.5 mm; staminal tube 4.5–5 mm long, anther 0.4 mm. Pistil 4–4.5 mm long, many-ovuled, stigma ellipsoid. Legume 2.5–3 mm long, 1-seeded, obovate, laterally slightly compressed, veined and exserted from the calyx.

Habitat and distribution. It is quite common in the Mediterranean region from sea level to 600–700 m, within the garigues of the Cisto-Micromerietea class (Oberdorfer, 1954). It sometimes occurs within the thermophilous communities of the Quercetalia calliprini order (Zohary, 1955). *Anthyllis hermanniae* subsp. *hermanniae* is widespread in the northeastern Mediterranean area, particularly in Montenegro (Browicz, 1978), Albania, Greece, the Aegean Islands, Crete, and western Anatolia in Turkey (Fig. 1).

Phenology. Flowering April to June; fruiting May to July.

Chromosome number. $2n = 14$ (Cardona & Contandriopoulos, 1983; Cardona et al., 1986).

Conservation status. Not endangered (IUCN, 2001, 2003).

The species was described from Greece by Linnaeus (1753), but has been recorded for many other Mediterranean localities by other authors. A watercolor iconography of *Anthyllis hermanniae* L. has been issued by Sibthorp and Smith (1832, plate 683). The morphological differences among the subspecies *hermanniae* and the other subspecies are listed in Table 1.

Additional specimens examined. ALBANIA. **Valona:** "in dumetis ad Krionero, in territ. Valonae, Jul. 1889," *Baldacci s.n.* (FI, PAL); "Bezirk, Mali Lica S-hang, 8 Jul. 1980," *Krendl s.n.* (W); "Cika von Kafˇe Logara [Logara Pass] zum Mali Kores, 21 Aug. 1979," *Krendl s.n.* (W). GREECE. **Attica:** "bei Athena," s.d., *Montbret s.n.* (W); "prope Athenas," *Orphanites 388* (FI); "Athenes at Cap Colonna, 27 May 1833," *Montbret s.n.* (W); "in Imetto meridonalis, 23 May 1852," *Heldreich s.n.* (FI); "Hymettus, May 1842," *Boissier s.n.* (NAP, W); "in rup. pr. Veleeris, Jun. 1876," *Pichler s.n.* (FI, M, WU); "Rafina 17 May 1912," *Abel s.n.* (M); "Pentelikon, 17 Jun. 1897," *Leonis s.n.* (FI); "Mt Parnos, Apr. 1933," *Guidi s.n.* (FI); "in M. Parnethi pr. Dekeleiam (Hod. Tatoi), 15 Jun. 1875," *Heldreich s.n.* (W); "in jugo montis Kithoiran supra Erithrae," *Reichinger 19926* (W); "Loutsa, Preveza, 8 Jun. 2001," *Brullo & Musarella s.n.* (CAT); Nafpaktos, Golfo di Korinthos, 9 June 2004, *Brullo & Musarella s.n.* (CAT). **Chios:** "Chio," *Aucher-Eloy 1096* (G); "Insel Chios, Kap Hellenis, ca. 5 km S Chios," *Ludtke 428* (B). **Crete:** "Candia," s.d., *Sieber s.n.* (G); "Sfakia (Creta), in saxosis ad litt. mari, May," *Heldreich s.n.* (FI); "Sitia, Taplou," *Gandoger 358* (FI); "in dumetis ad Arkanes distr. Temenas, 5 Jun. 1899," *Baldacci s.n.* (M, W, WU); "in fruticetis Sphakia, ad Hagio Rumeli, 1846," *Heldreich s.n.* (W); "Sfakia, Insula Gaudos, in collis arenosis ad promontorium Tsuno," *Reichinger 13666* (W); "distr. Hierapetra in arenosis Insulae Gaudoronissi," *Reichinger 13142* (W); "nordkuste, Knossos bei Candia, 24 Apr. 1914," *Wettstein s.n.* (M, WU); "Kommos, 1.3 km W from Ptsidia," *Shay 80556* (B); "Kalavitis (Ierapetra), 27 Jun. 2002," *Brullo & Giusso s.n.* (CAT). **Cyclades:** "Insula Syra, 1838," s.l. (W); "Insula Naxos, ad H. Joannis," *Leonis 82* (M, W, WU); "Milo," s.d., *Jaquin s.n.* (W); "Thera, Phira profitis Elias Akrothiri Mikos elios zwischen Ia und Mikro elios, 14 May 1973," *Krendl s.n.* (W); "Thira (Santorini), berg Profitis Ilias, Nordst flauche oberhalb Kamari, 16 May 1990," *Raus & Sipmon s.n.* (B); "Kythera, Feloti Bay, Aghios Pelaghia presso Chora Kythera, 15 Jun. 2004," *Brullo & Musarella s.n.* (CAT). **Dodecanese:** "Rhodes, coteaux in cultes près Bastida," *Bourgeau 20* (FI); "Is. di Rodi (Egeo), Lindos Jannadi," *Fiori 249* (FI); "Karpathos," *Forsyth-Major 81* (FI); "inter Spoa et Mte Lasto (Karpathos), 2 Jun. 1883," *Pichler s.n.* (FI, M, WU); "Insula Karpathos, ad boreo-occidentem, parti Finiki, versus promontorium," *Greuter 5150* (W); "Karpathos North-West exponenrte Schlucht zwichen Lefkas und Mesocon, 25 May 1983," *Raus s.n.* (B). **Epirus:** "Ioannina, Dhodhonis, 1.4 km W Platania," *Willing 8551* (B); "Arta, SW Kipseli," *Willing 8783* (B). **Evvoia:** "Insula Euboia septentrionalis in jugo inter Psacha et Achmet Aga (Prokopion) prope Hagios," *Reichinger 16422* (W). **Ionian Islands:** "dintorni di Carpi, Isole ioniche, May 1890," *Vaccari s.n.* (FI); "in M. Agi Deka, in insula Coreyra, Jun. 1888," *Baldacci s.n.* (FI, PAL, RO); "in apricis prope Garouna, in Insula Corfù," *Letourneux 335* (FI, W); "in collibus prope Argosteli, Cephaloniae, 17 Oct. 1834," *Shimper & Wiett, s.n.* (FI, G, W); "Cephalonia, Fiskardo, 8 Jun. 2004," *Brullo & Musarella s.n.* (CAT); "Insulae Zakinthos, in regi inf. montis Skopis," *Bornmüller 183* (W); Zante, May 1837, *Margot s.n.* (G). **Lesbos:** "Lesvos, around Tarti village at the S coast," *Nielsen 9772* (B); "Tokmakia Isles (NE of Lesbos), Apronisos," *Edmandson & McClintock 2487* (B). **Macedonia:** "in collibus ad Tessalonicum, Jun. 1900," *Adamovic s.n.* (W); "in pascuis saxosis submontanis int. Kortiathi, Jun. 1906," *Adamovic s.n.* (M, W, WU); "Insel

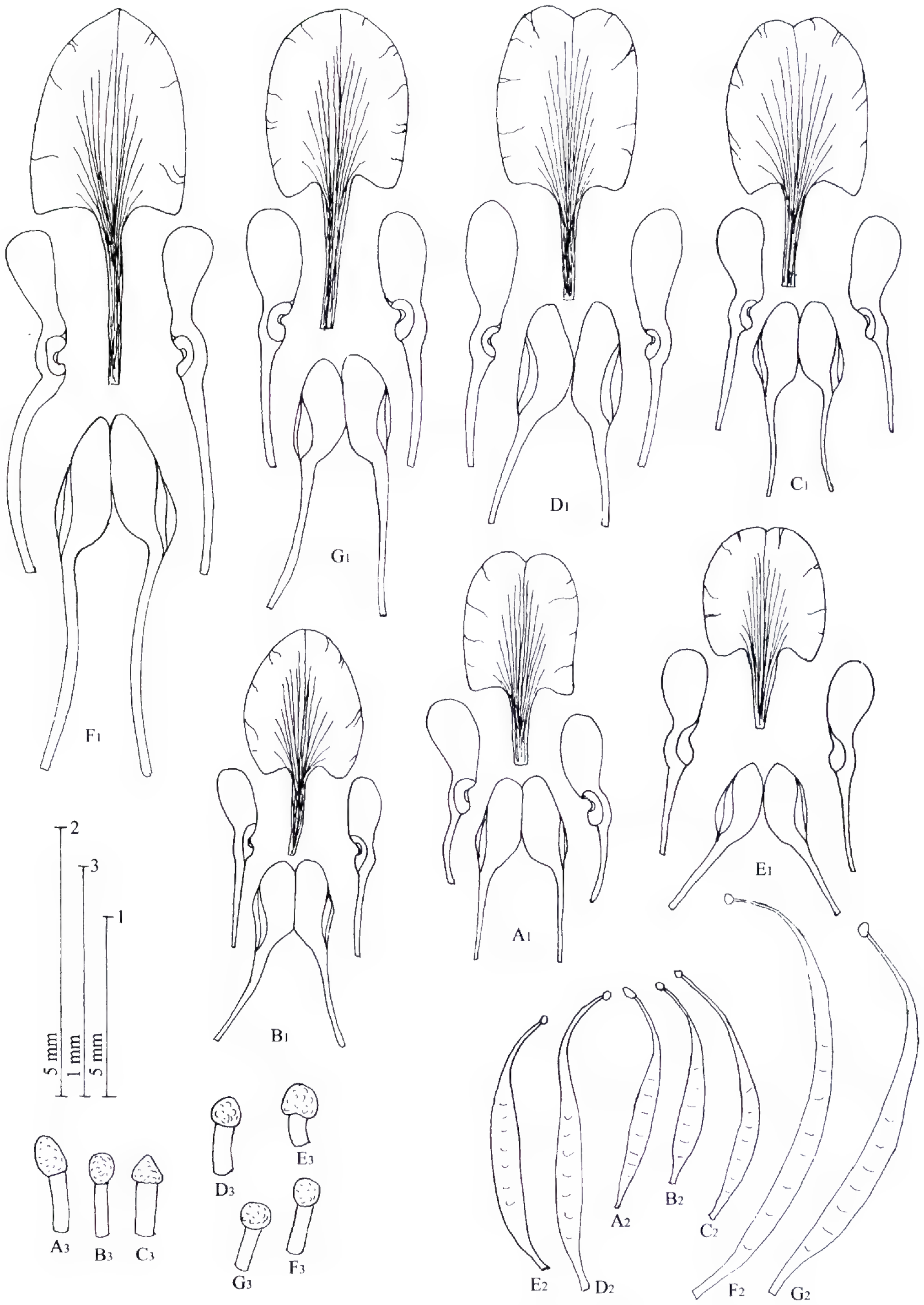

Figure 2. *Anthyllis hermanniae* L. —A. subsp. *hermanniae*. —B. subsp. *melitensis* Brullo & Giusso. —C. subsp. *sicula* Brullo & Giusso. —D. subsp. *brutia* Brullo & Giusso. —E. subsp. *japygica* Brullo & Giusso. —F. subsp. *ichnusae* Brullo & Giusso. —G. subsp. *corsica* Brullo & Giusso. —1. Corolla pieces. —2. Pistil. —3. Stigma. [A, based on "Crete, Kalavitis," *Brullo & Giusso s.n.* (CAT); B, based on "Saint Paul Bay," *Brullo, Pavone & Ronsisvalle s.n.* (CAT); C, based on *Citarda 1106* (FI); D, based on "Calabria, dune di Capo Rizzuto," *Brullo & Giusso s.n.* (CAT); E, based on "Puglia, Torre del Pizzo, Gallipoli," *Brullo, Giusso & Tomaselli s.n.* (CAT); F, based on "Sardegna, Dorgali, alla base di Mte. Tolui (presso la galleria)," *Bacchetta, Brullo, Casti & Giusso s.n.* (CAT); G, based on "Corsica, Vizzavona, sotto Mte. Rotondo," *Brullo, Giusso, Guarino & Pott s.n.* (CAT).]

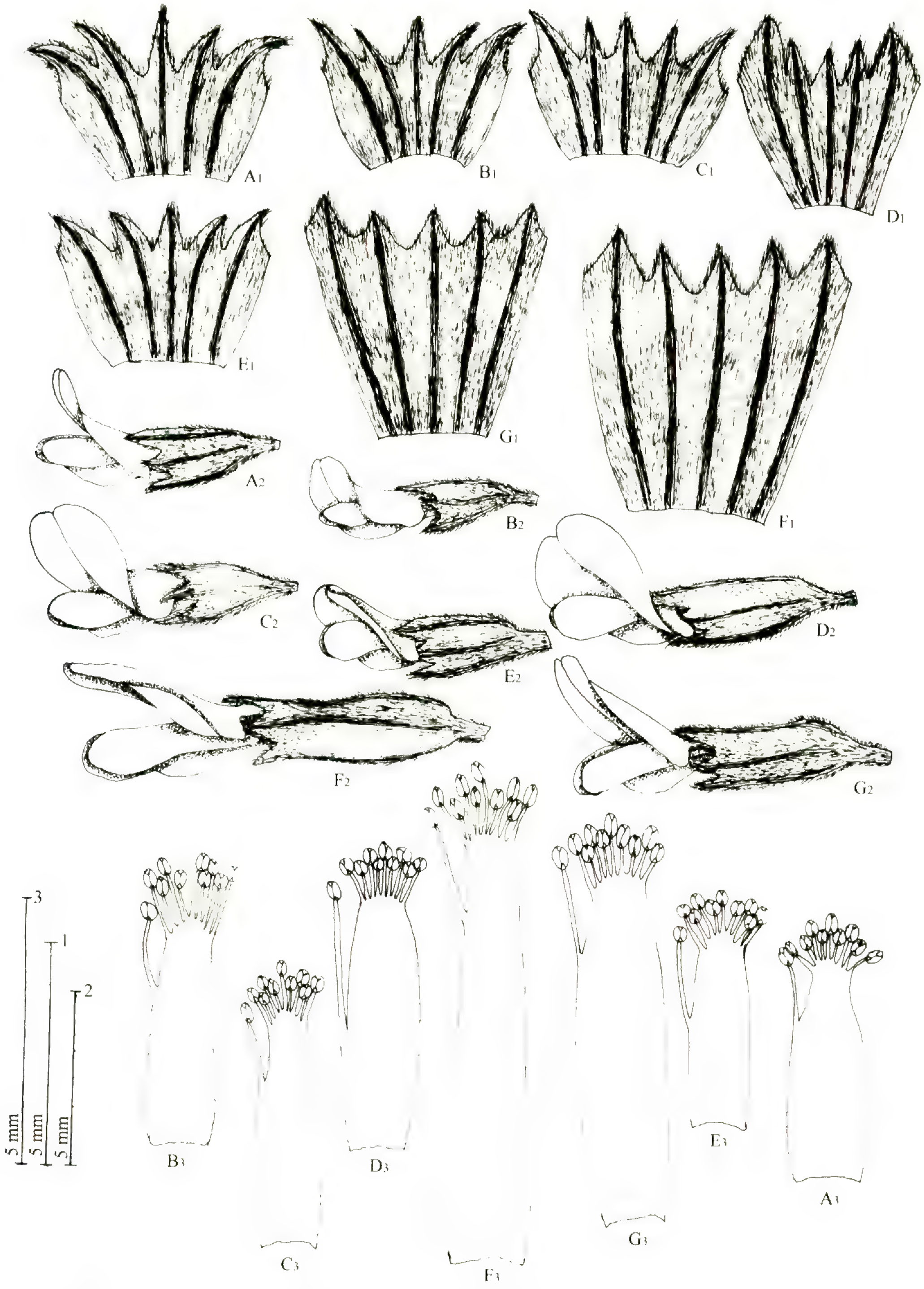

Figure 3. *Anthyllis hermanniae* L. —A. subsp. *hermanniae*. —B. subsp. *melitensis* Brullo & Giusso. —C. subsp. *sicula* Brullo & Giusso. —D. subsp. *brutia* Brullo & Giusso. —E. subsp. *japygica* Brullo & Giusso. —F. subsp. *ichnusae* Brullo & Giusso. —G. subsp. *corsica* Brullo & Giusso. —1. Open calyx. —2. Flower. —3. Staminal tube. [A. based on "Crete, Kalavitis," *Brullo & Giusso s.n.* (CAT); B. based on "Saint Paul Bay," *Brullo, Pavone & Ronsisvalle s.n.* (CAT); C. based on *Citarda 1106* (FI); D. based on "Calabria, dune di Capo Rizzuto," *Brullo & Giusso s.n.* (CAT); E. based on "Puglia, Torre del Pizzo, Gallipoli," *Brullo, Giusso & Tomaselli s.n.* (CAT); F. based on "Sardegna, Dorgali, alla base di Mte. Tolui (presso la galleria)," *Bacchetta, Brullo, Casti & Giusso s.n.* (CAT); G. based on "Corsica, Vizzavona, sotto Mte. Rotondo," *Brullo, Giusso, Guarino & Pott s.n.* (CAT).]

Table 1. Comparative scheme of the morphological characters of *Anthyllis hermanniae* L.

Characters	subsp. *hermanniae*	subsp. *melitensis*	subsp. *sicula*	subsp. *brutia*	subsp. *japygica*	subsp. *ichnusae*	subsp. *corsica*
No. of leaflets	1–3(5)	1–3	1–3	1(3)	1(3)	1–3	1–5
Calyx length (mm)	3.2–4.5	2.8–3.2(3.5)	3.5–3.7	4.5–5.5	3.5–4.5	5.5–7	5–5.5
Upper calyx teeth length (mm)	1–1.6	1–1.4	1.2–1.3	1.4–1.6	1.4–1.5	0.5–0.8	0.7–1
Upper calyx teeth shape	curved	curved	curved	straight	curved	straight	straight
Lower calyx teeth length (mm)	0.9–1.5	0.8–1	0.9–1.1	0.9–1.1	0.8–1.4	0.8–1	0.6–1
Lower calyx teeth shape	straight to slightly curved	straight to slightly curved	straight	straight	straight to slightly curved	straight	straight
Standard length (mm)	5.8–6.5	5.5–6.5	7–8	7.8–9	5.5–6.5	10–11	8–9.5
Standard limb width (mm)	3.2–3.8	2.8–3.4	3.5–4.2	4.2–4.4	3–4	4.5–4.7	3.5–4
Standard apex	retuse	rounded	retuse	retuse	retuse	somewhat obtuse	rounded
Wings length (mm)	5.4–6.2	5.2–5.5	6–6.5	7.2–7.8	5–6	10–11	7.5–8
Keel length (mm)	5–5.5	5.5–5.8	6–6.2	6.5–7	5–6	9.5–10	7–7.5
Staminal tube length (mm)	4.5–5	4.5–5	5–5.5	5–5.5	4–4.2	9–9.5	7–7.5
Anther length (mm)	0.4	0.3–0.4	0.3	0.3	0.3	0.45–0.50	0.4–0.5
Pistil length (mm)	4–4.5	3–3.5	5–5.2	6	5	9–9.5	8
Stigma shape	ellipsoid	suborbicular to ellipsoid	ovoid-sub-conical	conical-ovoid	conical-ovoid	globose	globose

Samothrake oberhalb Chora, 29 Jun. 1983," *Krendl s.n.* (W); "2 km est Podochorian, am S-Fuss des Pangaidi gebirges Nomos Kavalla, 19 Sept.–8 Oct. 1966," *Bauer & Spitzenberger s.n.* (W); "Trakien, W. Alexandropolis ca. 1 km W Makri, 22 May 1979," *Krendl s.n.* (W); "Insel Thasos, zwischen Kirini und Skala, 17 Jun. 1984," *Burri & Krendl s.n.* (W); "regi infer. Hagios Oros, Jul. 1908," *Dimonie s.n.* (M, WU). **Northern Sporades:** "Ins. Youra, ad promontorium Angistri," *Phytos & Kamari 19702* (B). **Peloponissos:** "Nauplia," s.d., *Zuccarini s.n.* (W); "Argolide," s.d., *Spruner s.n.* (W); "Achaia in collibus lapidosis prope urbem Patras," 4 Jun. 1893, *Halácsy s.n.* (B, M, W, WU); "prov. Ilio, along road from Olympia to Lalas and Lambia, ca. 3 km after the village of Miraka," *Christensen & Bruhn-Møller 1248* (W); "Laconia, ad radices australes montium Parnon in saxosis calc. inter Skala et Molaici, ca. 22 km a Skala orientem versus," *Reichinger 20013* (W); "Elis in arenosi maritimi Liutri, 1 Jun. 1899, *Heldreich s.n.* (M, WU); "Mani Peninsula, rupi calcaree, Kologonianika, 12 Jun. 2004," *Brullo & Musarella s.n.* (CAT); "M. Taygetos, presso Mistra, 12 Jun. 2004," *Brullo & Musarella s.n.* (CAT); "Cap Tenaro, Marmari, 11 Jun. 2004," *Brullo & Musarella s.n.* (CAT); "Kalamata, 11 Jun. 2004," *Brullo & Musarella s.n.* (CAT). **Samos:** "ca. 1 km S Samos, 17 Jun. 1983," *Krendl s.n.* (W); "Vathi, 2 May 1902," s.l. (M, WU). TURKEY. **Caria:** "C1 Mugla, zur Kiridos u Datkan, 9 Apr. 1984," *Sorger s.n.* (W). **Lydia:** "Izmir, Hugel NE von Bornova," *Fitz & Spitzenberger 614* (W); "Smyrna, Burnova in collibus calcareis," *Schwarz 584* (B); "in macchia montis ivi Kardaz prope Izmir, Asia Minore, 16 Jul. 1932," *Regel s.n.* (G); "coteaux calcaires bordant la rouche conduisant de Smyrnae Boudja," *Balanza 196* (B, G, W); "Lidia, Bunarbaschi, in monte Takhtali Dagh," *Bornmüller 9237* (W). **Mysia:** "Belikesin Ayvalik," *Fitz & Spitzenberger 598* (W). **Phrygia:** "Cannakkale (Gelibolu), kuste S Kilitbahir, 5 May–8 Jun. 1968," *Bauer, Fitz & Spitzenberger s.n.* (W); A1 Cannakkale, 29 May 1966," *Sorger s.n.* (W); "Dardanelles, in montosis," *Ascherson 900* (PAL). **Thracia:** "in ericetis ad Bosforum, Jul. 1850," *Clementi s.n.* (FI, M, NAP, RO, W, WU); "Costantinople, collines decuvertes près de Halkali, 21 Jun. 1896, *Aznavour s.n.* (B); "Costantinopoli, in montosis aquae dulcis, 19 Jun. 1844," *Voë s.n.* (G, W); "in agro Byzantino, ad cacumen collium Boulgourlou & Tsechonilidsicha, supra Skutari, Anatoliae, 17 Jun. 1890," *Degen s.n.* (W).

2b. Anthyllis hermanniae L. subsp. **melitensis** Brullo & Giusso, subsp. nov. TYPE: Malta, "San Paulo a mare, in rupestribus apricis, 3 May 1907," *Sommier s.n.* (holotype, FI). Figures $2B_1$–B_3, $3B_1$–B_3.

A subspecie typica calyce 2.8–3.2(–3.5) mm longo, dentibus superioribus 1–1.4 mm longis, inferioribus 0.8–1 mm longis, vexillo apice rotundato, 5.5–6.5 mm longo, limbo 3.5–4.2 × 2.8–3.4 mm, alis 5.2–5.5 mm longis, ungue 2.3–2.5 mm longo, limbo 2.8–3 × 0.8–1 mm, carina 5.5–5.8 mm longa, unguibus 3–3.2 mm longis, anthera 0.3–0.4 mm longa, pistillo 3–3.5 mm longo, stigmate suborbiculari-ellipsoideo differt.

Calyx 2.8–3.2(–3.5) mm long, with upper teeth 1–1.4 mm long and lower ones 0.8–1 mm long, standard rounded at apex, 5.5–6.5 mm long, with limb 3.5–4.2 × 2.8–3.4 mm, wings 5.2–5.5 mm long, with claw 2.3–2.5 mm long and limb 2.8–3 × 0.8–1 mm, keel 5.5–5.8 mm long, with claws 3–3.2 mm long; anther 0.3–0.4 mm long, pistil 3–3.5 mm long, stigma suborbicular-ellipsoid. The other characters are similar to those of subspecies *hermanniae*.

Habitat and distribution. It occurs in the Maltese Archipelago (Malta, Gozo, and Comino) on rocky calcareous coastline (Fig. 1), where it is a member of the subhalophilous plant communities of the Crithmo-Limonietea class or garigues of the Cisto-Micromerietea class (Brullo et al., 1997).

Phenology. Flowering April to May; fruiting May to June.

Chromosome number. Unknown.

Conservation status. EN A2acd; B2a (IUCN, 2001, 2003).

Etymology. The specific epithet refers to "Melita," the ancient name of the island of Malta.

The Maltese populations have been previously referred to *Anthyllis hermanniae* L. s. str. (Sommier & Caruana Gatto, 1915; Borg, 1927; Haslam et al., 1977).

Paratypes. MALTA. **Comino:** "Insula Comino, in rupium rimis, 7 May 1907," *Sommier s.n.* (FI); "Comino, 27 Sept. 1985," *Brullo & Pavone s.n.* (CAT). **Gozo:** Gaulos "in saxosis maritimis prope Ras el Kala, 15 Apr. 1874," *Duthie s.n.* (FI); "Ta Cene, 29 Jun. 1973," *Brullo s.n.* (CAT). **Malta:** "Insula Melita, Tabarda, 11 Apr. 1906," *Sommier s.n.* (FI); "Ued Encita, 13 Apr. 1906," *Sommier s.n.* (FI); "in saxosis maris, Marfa, 30 Apr. 1874," *Duthie s.n.* (FI); "Melitae, May 1847," *Grech Delicata s.n.* (FI); "Malta," s.d., *Todaro & Calcara s.n.* (FI); "Malta," s.d., s.l. (W); "Arejten Point, 25 Jun. 1973," *Brullo & Ronsisvalle s.n.* (CAT); "Bahriya Valley, 25 Jun. 1973," *Brullo & Ronsisvalle s.n.* (CAT); "Qrejten Point, 9 Apr. 1984," *Brullo & Ronsisvalle s.n.* (CAT); "Ras Ilryieya, 26 Jun. 1973," *Brullo & Ronsisvalle s.n.* (CAT); "Rampla Tar-Torri, 26 Jun. 1973, *Brullo & Ronsisvalle s.n.* (CAT); "Saint Paul Bay, 11 Apr. 1987," *Brullo, Pavone & Ronsisvalle s.n.* (CAT); "Marfa, Armier Bay, 11 Apr. 1987," *Brullo, Pavone & Ronsisvalle s.n.* (CAT); "Tal Blata, 9 Apr. 1984," *Brullo & Ronsisvalle s.n.* (CAT); "Gar Lapsi, 10 Apr. 1984," *Brullo & Ronsisvalle s.n.* (CAT).

2c. Anthyllis hermanniae L. subsp. **sicula** Brullo & Giusso, subsp. nov. TYPE: Italy, Sicilia, "in collis Siciliae meridionalis, Terranova," May, *Citarda 1106* (holotype, FI; isotype, PAL). Figures 2C$_1$–C$_3$, 3C$_1$–C$_3$.

A subspecie typica inferioribus dentibus calycis 0.9–1.1 mm longis, vexillo 7–8 mm longo, ungue 2.6–3 mm longo, limbo 1–5 × 3.5–4.2 mm, alis 6–6.5 mm longis, ungue 2.7–3 mm longo, limbo 3.5–3.7 × 1.3–1.5 mm, carina 6–6.2 mm longa, unguibus 2.8–3.2 mm longis, staminео tubo 5–5.5 mm longo, antherа 0.3 mm longa, pistillo 5–5.2 mm longo, stigmate ovoideo-subconico differt.

Calyx with lower teeth 0.9–1.1 mm long, standard 7–8 mm long, with claw 2.6–3 mm long and limb 1–5 × 3.5–4.2 mm, wings 6–6.5 mm long, with claw 2.7–3 mm long and limb 3.5–3.7 × 1.3–1.5 mm, keel 6–6.2 mm long, with claws 2.8–3.2 mm long; staminal tube 5–5.5 mm long, anther 0.3 mm long, pistil 5–5.2 mm long, stigma ovoid-subconical. The other characters are similar to those of the subsp. *hermanniae*.

Habitat and distribution. Based on herbarium and literature data, this taxon should be localized on calcareous coastal habitats of southern Sicily (Fig. 1). It has been found by Gussone (1828) near Torre Falconara (between Gela and Licata) and Palmi (today Palma di Montechiaro). There is also a herbarium specimen collected near Terranova (Gela) by Citarda (*1106*, FI and PAL). At the present time, the Sicilian population seems to have definitely disappeared, since it has not been recently collected.

Phenology. Flowering May to June; fruiting June.

Chromosome number. Unknown.

Conservation status. EX (IUCN, 2001, 2003).

Etymology. The specific epithet refers to "siculus," the Latin adjectival form for Sicily.

As it is possible to deduce from the herbarium material, the only records for Sicily concerning this plant are dated back to the early nineteenth century. It is likely there were very localized populations with only few plants.

Paratypes. ITALY. **Sicily:** "in collis Siciliae meridionalis, Terranova," *Todaro 1106* (PAL, W); "sotto Torre Falconara," s.d., s.l. (PAL); "Torre Falconara, in aridis collibus maritimis, May–Jun.," *Presl s.n.* (NAP).

2d. Anthyllis hermanniae L. subsp. **brutia** Brullo & Giusso, subsp. nov. TYPE: Italy, "Calabria, dune di Capo Rizzuto, 24 Apr. 2002," *S. Brullo & G. Giusso s.n.* (holotype, CAT; isotypes, CAT, FI, MO). Figures 2D$_1$–D$_3$, 3D$_1$–D$_3$.

A subspecie typica foliis 1-foliolatis (rare 3-foliolatis), calyce 1.5–5.5 mm longo, superioribus dentibus erectis, 1.4–1.6 mm longis, inferioribus 1.5–1.7 mm longis, vexillo 7.8–9 mm longo, ungue 2.5–3.2 mm longo, limbo 5.4–6 × 4.2–4.6 mm, alis 7.2–7.8 mm longis, ungue 3.2–3.5 mm longo, limbo 4.2–4.5 × 1.5–1.8 mm, carina 6.5–7 mm longa, unguibus 3.5–4 mm longis, staminео tubo 5–5.5 mm longo, antherа 0.3 mm longa, pistillo 6 mm longo, stigmate conico-ovoideo differt.

Leaves 1-foliolate (rarely 3-foliolate), calyx 4.5–5.5 mm long, with upper teeth straight, 1.4–1.6 mm long, lower ones 1.5–1.7 mm long, standard 7.8–9 mm long, with claw 2.5–3.2 mm long and limb 5.4–6 × 4.2–4.6 mm, wings 7.2–7.8 mm long, with claw 3.2–3.5 mm long and limb 4.2–4.5 × 1.5–1.8 mm, keel 6.5–7 mm long, with claws 3.5–4 mm long; staminal tube 5–5.5 mm long, anther 0.3 mm long, pistil 6 mm long, stigma conical-ovoid. The other

characters are similar to those of subspecies *hermanniae*.

Habitat and distribution. *Anthyllis hermanniae* subsp. *brutia* occurs in southern Italy, near Capo Rizzuto, Calabria (Fig. 1). It colonizes stabilized inner dunes, where it grows on sandy substrates, somewhat cemented, within garigues belonging to the Cisto-Micromerietea class (Brullo et al., 1997).

Phenology. Flowering April to May; fruiting May to June.

Chromosome number. $2n = 14$ (Peruzzi & Cesca, 2002).

Conservation status. CR C1 (IUCN, 2001, 2003).

Etymology. The specific epithet refers to "brutia," the ancient name of Calabria.

Paratypes. ITALY. **Calabria:** "Capo Rizzuto, May 1825," *Gussone s.n.* (NAP); "tra Le Castella e Capo Rizzuto, 14 May 1825," *Gussone s.n.* (NAP); "Isola di Capo Rizzuto [Italy, prov. Crotone], Soverato entre Capo Piccolo et Le Castella, 15 Jun. 1995," *Aldobrandi, Baldini & Nepi s.n.* (B, FI, G); "Calabria a Crotone," s.d., *Fiorini-Mazzanti s.n.* (RO); "Dune di Capo Rizzuto, 7 Jun. 2004," *Brullo & Musarella s.n.* (CAT).

2e. Anthyllis hermanniae L. subsp. **japygica** Brullo & Giusso, subsp. nov. TYPE: Italy. "Puglia, Torre del Pizzo, Gallipoli, 23 Apr. 2002," *S. Brullo, G. Giusso & V. Tomaselli* (holotype, CAT; isotypes, CAT, FI, MO). Figures $2E_1$–E_3, $3E_1$–E_3.

A subspecie typica foliis 1-foliolatis (rare 3-foliolatis), dentibus calycis 0.7–1.2 longis, carina 5.5–6 mm longa, stamineo tubo 4–4.2 mm longo, anthera 0.3 mm longa, pistillo 5 mm longo, stigmate conico-ovoideo differt.

Leaves 1-foliolate (rarely 3-foliolate), calyx with teeth 0.7–1.2 mm long, keel 5.5–6 mm long; staminal tube 4–4.2 mm long, anther 0.3 mm long, pistil 5 mm long, stigma conical-ovoid. The other characters are similar to those of the subspecies *hermanniae*.

Habitat and distribution. It grows on sandy substrates and calcarenite in southern Italy near Gallipoli, Apulia (Fig. 1), where it is a member of the thermophilous garigues of the Cisto-Micromerietea class (Caniglia et al., 1974).

Phenology. Flowering April to May; fruiting May to June.

Chromosome number. $2n = 14$ (S. Brullo, unpublished data).

Conservation status. CR C1 (IUCN, 2001, 2003).

Etymology. The specific epithet refers to "Japygia," the ancient name of southern Apulia.

This subspecies was also originally collected by Gussone (1826), not far from Gallipoli in Italy. From the size and the shape of the floral parts, this subspecies may be considered as the most similar to the subspecies *hermanniae*. This is probably due to the paleogeographic history of Apulia, which had many land connections with the Balkan region, especially during the last Quaternary glaciations.

Paratypes. ITALY. **Apulia:** "Callipolem, Japigia, Jun. 1883," *Groves s.n.* (FI); "ad rupes prope Gallipoli, Jun. 1883," *Groves s.n.* (FI); "Gallipoli in saxosis aridis prope urbem," *Lacaita 84* (FI); "Gallipoli," *Lacaita 2595* (FI); "presso Gallipoli, Jun. 1886," *Baldacci s.n.* (FI); Gallipoli, 4 Jun., *Gussone s.n.* (NAP); Torre del Pizzo, Gallipoli, 23 Apr. 2002, *Brullo, Giusso & Tomaselli s.n.* (CAT).

2f. Anthyllis hermanniae L. subsp. **ichnusae** Brullo & Giusso, subsp. nov. TYPE: Italy. "Sardegna, Dorgali, alla base di Mte. Tolui (presso la galleria), 29 May 2002," *G. Bacchetta, S. Brullo, M. Casti & G. Giusso* (holotype, CAT; isotypes, CAT, FI, MO). Figures $2F_1$–F_3, $3F_1$–F_3.

A subspecie typica calyce 5.5–7 mm longo, superioribus dentibus erectis, 0.5–0.8 mm longis, inferioribus 0.8–1 mm longis, vexillo obtusiusculo apice, 10–11 mm longo, ungue 5–5.5 mm longo, limbo 5.5–6 × 4.5–7 mm, alis 10–11 mm longis, ungue 5.5–6 mm longo, limbo 4.5–5 × 1.3–1.5 mm, carina 9.5–10 mm longa, unguibus 6–6.5 mm longis, stamineo tubo 9–9.5 mm longo, anthera 0.45–0.50 mm longa, pistillo 9–9.5 mm longo, stigmate globoso differt.

Calyx 5.5–7 mm long, with upper teeth straight, 0.5–0.8 mm long, lower ones 0.8–1 mm long, standard somewhat obtuse at apex, 10–11 mm long, with claw 5–5.5 mm long and limb 5.5–6 × 4.5–7 mm, wings 10–11 mm long, with claw 5.5–6 mm long and limb 4.5–5 × 1.3–1.5 mm, keel 9.5–10 mm long, with claws 6–6.5 mm long; staminal tube 9–9.5 mm long, anther 0.45–0.50 mm long, pistil 9–9.5 mm long, stigma globose.

Habitat and distribution. *Anthyllis hermanniae* subsp. *ichnusae* is an orophilous species distributed at an altitude between 700 and 1400 m, where it is a member of the high-mountain chamaephytic vegetation of the Carici-Genistetea lobelii class (Klein, 1972; Arrigoni & Di Tommaso, 1991). Usually, this subspecies is found on the carbonatic substrates of certain mountains from central-eastern Sardinia, whereas it occurs on volcanic rocks much more rarely (Fig. 1).

Phenology. Flowering May to June; fruiting June to July.

Chromosome number. $2n = 14$ (Cusma Velari et al., 2002).

Conservation status. VU E (IUCN, 2001, 2003).

Etymology. The specific epithet refers to "Ichnusa," the ancient name of Sardinia.

The Sardinian populations are morphologically more differentiated compared with the subspecies *hermanniae*. This is likely the result of their long geographic isolation.

Paratypes. ITALY. **Sardegna:** "in Monte Tolui, prope Dorgali, 25 May 1884." *Forsyth-Major s.n.* (FI); "Dorgali, Rupi del Monte Vardia, 19 Jun. 1895." *Martelli s.n.* (FI); "inter rupium montium fissuras, Dorgali, Sardin. orient., Jun.," *Moris s.n.* (FI); "Sardin.," s.d., *Moris s.n.* (G); "pr. Nuoro, Dorgali, bords de la route de la P. Scala Marina, ca.1 km de la sortie de Dorgali," *Charpin, Dittrich, Jeanmonod & Camarda 1C. 17779* (FI, G); "Oliena, per la via verso Frumincorbu, 12 Jun. 1895," *Martelli s.n.* (FI); "M. d'Oliena, Punta Corrasi, 18 May 1952," *Martinoli s.n.* (FI); "in Sard.," s.d., *Huguenin s.n.* (M); "Orune, Monti su Consolo, fra le rupi, May 1899," *Martelli s.n.* (FI, W); "Orune, Magopro, 1899," *Martelli s.n.* (B); "in Sard.," s.d., *Huguenin s.n.* (WU); "Montarbu di Seui, 25 Jul. 2002," *Bacchetta, Brullo, Casti & Giusso s.n.* (CAT); "Campo Bargios, Supramonte di Urzulei, 12 Jul. 2000," *Bacchetta, Brullo, Giusso & Guarino s.n.* (CAT); "Monte Albo, cima calcarea, 20 Jun. 1996," *Brullo, De Marco & Guarino s.n.* (CAT); "fontana prima di Genna Silana, 7 Jun. 2001," *Bacchetta, Brullo, Casti & Giusso s.n.* (CAT); "Monti Ferru, Badde Urbara, 3 Jun. 2002," *Brullo, Casti & Giusso s.n.* (CAT).

2g. Anthyllis hermanniae L. subsp. **corsica** Brullo & Giusso, subsp. nov. TYPE: France. "Corsica, Vizzavona, sotto Mte. Rotondo, 10 Jun. 1999," *S. Brullo, G. Giusso, R. Guarino & R. Pott* (holotype, CAT; isotypes, CAT, FI, MO). Figures $2G_1$–G_3, $3G_1$–G_3.

A subspecie typica calyce 5–5.5 mm longo, superioribus dentibus erectis, 0.7–1 mm longis, inferioribus 0.6–1 mm longis, vexillo rotundato apice, 8–9.5 mm longo, ungue 3.7–4.5 mm longo, limbo 4.8–5.5 × 3.5–4 mm, alis 7.5–8 mm longis, ungue 3.7–4.2 mm longo, limbo 3.8–4 × 1.3–1.5 mm, carina 7–7.5 mm longa, unguibus 3.8–4 mm longis, staminео tubo 7–7.5 mm longo, anthera 0.4–0.5 mm longa, pistillo 8 mm longo, stigmate globoso differt.

Calyx 5–5.5 mm long, with upper teeth straight, 0.7–1 mm long, lower ones 0.6–1 mm long, standard rounded at apex, 8–9.5 mm long, with claw 3.7–4.5 mm long and limb 4.8–5.5 × 3.5–4 mm, wings 7.5–8 mm long, with claw 3.7–4.2 mm long and limb 3.8–4 × 1.3–1.5 mm, keel 7–7.5 mm long, with claws 3.8–4 mm long; staminal tube 7–7.5 mm long, anther 0.4–0.5 mm long, pistil 8 mm long, stigma globose.

Habitat and distribution. *Anthyllis hermanniae* subsp. *corsica* is quite frequent in Corsica, where it occurs mainly on siliceous massifs and more rarely on carbonatic massifs (Fig. 1). It is found at altitudes between 800 and 2000 m, within the orophilous chamaephytic communities of the Carici-Genistetea lobelii class (Klein, 1972; Gamisans, 1977). It has been collected from one stand (Cap Corse, *Bernard 149*) growing almost at sea level, as a member of the thermophilous garigues of the Rosmarinetea officinalis class (Molinier, 1960). Those populations also occurring on the Gorgona Island (Tuscan Archipelago) are referred to *A. hermanniae* subsp. *corsica*.

Phenology. Flowering May to June; fruiting June to July.

Chromosome number. $2n = 14$ (Cardona et al., 1986; Contandriopoulos et al., 1987).

Conservation status. VU E (IUCN, 2001, 2003).

Etymology. The specific epithet refers to "Corsicus," the Latin adjectival form for Corsica.

The Corsican populations are morphologically and ecologically clearly differentiated from the Sardinian ones. In fact, the latter populations grow almost exclusively on carbonatic substrates and below 1400 m, while the Corsican populations prefer mainly siliceous substrates, reaching higher altitudes (ca. 2400 m).

Paratypes. FRANCE. **Corsica:** "Pialza près le Pont du Travo, 8 May 1935," *Aellen s.n.* (FI); "Monte Cagna, Postalasse," s.d., *Stefani s.n.* (B); "Mt Rotondo, in valli alpina prorupta Le Sciappe grolle," 10 Jul. 1880, *Ierier s.n.* (FI); "M. Rotondo," s.d., *Soleiroil s.n.* (G); "Vizzavona, sotto Mte. Rotondo, 10 Jun. 1999," *Brullo, Giusso, Guarino & Pott s.n.* (CAT); "Cap Corse," *Bernard 119* (G); "Cap Corse, à la crête du Prato Piccolo, 21 May 1968," *Salanon s.n.* (G); "Col di Teghime, inter St. Florent et Bastia, 2 Jul. 1880," *Ierier s.n.* (FI, G); "Sierra del Pigno di Bastia, 1867," *Pok s.n.* (FI); "côtes rocheuses à Bastia, *Mabille 93* (FI, G, W); "in locis saxosis maritimis circa Bastia, 10 May 1865," *Mabille s.n.* (M, WU); "Bastia, 11 Jun. 1912," *Spencer s.n.* (W); "Bastia, roches micaschisteuses aux Fango, 3 May 1867," *Debeaux s.n.* (W); "paturages des montagnes Bastia," *Kralik 532* (G, W); "Pietro Pugno, bei Bastia, 1829," s.l. (M, W, WU); "Bastia, unterhalb des Cima de Orcaro, 27 Jun. 1975," *Burri & Krendl s.n.* (W); "Bastia, in collibus aridis," s.d., *Salzmann s.n.* (G); "Monte Coscione," *Jordan 13* (B, FI, PAL, W); "Foret de Valdo-Niello sous le Col de Saint Pierre, alt. 1400 m, eboluis granitique à le limite superieure de l'hetraie," *Lambinon 8377* (B, FI, G); "Vallees du Mt Rotondo, 11 Aug. 1849," *Kralik s.n.* (W); "M. Renoso, 2 Aug. 1849," *Kralik s.n.* (G); "Monte d'Oro, 2400 m, Jul. 1938," *Rauh Halle s.n.* (B); "Forét d' Aitone," *Reverchon 62* (B, G, M, PAL, RO, W, WU); "coteaux in cultes pres Bastelica," *Bougeau 20* (W); "Bastelica," *Revechon 62* (M, WU); "Kessel von Tribulaccio, 18 Jul. 1981," *Vitek s.n.* (M, WU); "Corse," s.d., *Moricand s.n.* (NAP); "Lac de Nino, Aug. 1817, *Requien s.n.* (G); "Popaia, presso Col de Vergio, 12 Jun. 1999," *Brullo*

& *Giusso s.n.* (CAT); "strada per Mte. Cinto, presso Asco, 11 Jun. 1999," *Brullo, Giusso, Guarino & Pott s.n.* (CAT); "Morosaglia, discarica, 28 May 2004," *Brullo, Bacchetta & Casti s.n.* (CAT); "Ponte di Noceta, Venaco, 29 May 2004," *Brullo, Bacchetta & Casti s.n.* (CAT). ITALY. **Tuscany:** "Insula Gorgona," s.d., *Savi s.n.* (FI); "nei pascoli nell'isola di Gorgona, Jun. 1840," *Savi s.n.* (FI); "in saxosis siccis Gorgoniae, Jun. 1840," *Savi s.n.* (FI).

Key to the Species of the *Anthyllis hermanniae* Group from Mediterranean Europe

1a. Shrub densely spiny; leaves linear-lanceolate, acute; flowers solitary, rarely 2; calyx 1.8–3 mm long; standard 4–5 mm long . . . . . 1. 4. *hystrix*

1b. Shrub laxly spiny or subspinescent; leaves spathulate to oblanceolate, somewhat obtuse to slightly retuse; flowers in fascicles of 2 to 6; calyx 2.8–7 mm long; standard 5.5–11 mm long.

2a. Calyx 2.8–4.5 mm long, with teeth (at least the upper ones) curved (or curved-divaricate); wings 5–6.5 mm long; keel 5–6 mm long; pistil 3–5 mm long.

3a. Calyx 2.8–3.2 mm long; standard rounded . . . . . 2b. *A. hermanniae* subsp. *melitensis*

3b. Calyx 3.2–4.5 mm long, standard retuse.

4a. Standard 7–8 mm long. . . . . 2c. *A. hermanniae* subsp. *sicula*

4b. Standard 5.5–6.5 mm long.

5a. Leaves 1-foliolate (rarely 3-foliolate); calyx teeth 0.7–1.2 mm long; staminal tube 4–4.2 mm long . . . . . 2e. *A. hermanniae* subsp. *japygica*

5b. Leaves 1- to 3-foliolate (rarely 5-foliolate); upper calyx teeth 1.2–2 mm long; staminal tube 4.5–5 mm long. . . . . 2a. *A. hermanniae* subsp. *hermanniae*

2b. Calyx 4.5–7 mm long, with all teeth straight; wings 7–11 mm long; keel 6.5–10 mm long; pistil 6–9.5 mm long.

6a. Calyx 5.5–7 mm long; standard 10–11 mm long, somewhat obtuse; wings 10–11 mm long, keel 9.5–10 mm long; staminal tube 9–9.5 mm long . . . . . 2f. *A. hermanniae* subsp. *ichnusae*

6b. Calyx 4.5–5.5 mm long; standard 7.8–9.5 mm long, rounded or retuse, wings 7.2–8 mm long, keel 6.5–7.5 mm long, staminal tube 5–7.5 mm long.

7a. Leaves 1-foliolate (rarely 3-foliolate); standard retuse; staminal tube 5–5.5 mm long; anther 0.3 mm long; pistil 6 mm long . . . . . 2d. *A. hermanniae* subsp. *brutia*

7b. Leaves 1- to 5-foliolate; standard rounded; staminal tube 7–7.5 mm long; anther 0.4–0.5 mm long; pistil 8 mm long . . . . . 2g. *A. hermanniae* subsp. *corsica*

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Literature Cited

Arrigoni, P. V. & P. L. Di Tommaso. 1991. La vegetazione delle montagne calcaree della Sardegna centro-orientale. Boll. Soc. Sarda Sci. Nat. 28: 201–310.

Barceló i Combis, F. 1880. Flora de las Islas Baleares. Imp. Pedro José Gelabert. Palma de Mallorca.

Benedí, C. 2000. *Anthyllis* L. Pp. 829–863 *in* S. Talavera, C. Aedo, S. Castroviejo, A. Herrero, C. Romero-Zarco, F. J. Salgueiro & M. Velayos (editors), Flora Iberica 7(2). Graficas/85. Madrid.

Bolòs, O. de. & J. Vigo. 1974. Notes sobre taxonomia i nomenclatura de plantes, I. Butl. Inst. Catalana Hist. Nat., Secc. Bot. 38: 61–89.

Borg, J. 1927. Descriptive Flora of the Maltese Islands. Government Printing Office, Malta.

Braun-Blanquet, J., N. Roussine & R. Nègre. 1952. Les Groupements Végétaux de la France Méditerranéenne. Centre National de la Recherche Scientifique, Montpelier.

Browicz, K. 1978. Geographic distribution of some shrubs from the family Leguminosae in southwestern Asia. Arbor. Kórnickie 23: 5–30.

Brullo, S., P. Minissale & G. Spampinato. 1997. La classe Cisto-Micromerietea nel Mediterraneo centrale e orientale. Fitosociologia 32: 207–238.

Caniglia, G., F. Chiesura Lorenzoni, L. Curti, G. G. Lorenzoni & S. Marchiori. 1974. *Sarcopoterium spinosum* (L.) Spach ed *Anthyllis hermanniae* L., due relitti floristi nel Salento (Puglia). Atti IV Simp. Nat. Cons. Nat. 1: 315–330.

Cardona, M. A. & J. Contandriopoulos. 1983. Reports. Pp. 323–324 *in* A. Löve (editor), IOPB Chromosome Number Reports LXXIX. Taxon 32.

———, ——— & E. Sierra-Rafols. 1986. Étude biosystematique d'*Anthyllis hystrix* de Minorque et d'*A. hermanniae* de la Méditerranée orientale et centrale. Orsis 2: 5–25.

Contandriopoulos, J., J. Noguet & D. Zevago-Schmitz. 1987. Contribution à l'étude de quelques espèces interessantes de Corse: Cytotaxonomie et comportement écologique. Biol.-Ecol. Medit. 10: 259–271.

Cullen, J. 1968. *Anthyllis* L. Pp. 177–182 *in* T. G. Tutin, V. H. Heywood, N. A. Burges, V. M. Moore, D. H. Valentine, S. M. Walters & D. A. Webb (editors), Flora Europaea 2. University Press, Cambridge.

Cusma Velari, T., L. Feoli Chiappella, V. Kosovel, G. Bacchetta & S. Patui. 2002. Reports 1312–1314. Pp. 475–480, *in* G. Kamari, C. Blanché & F. Garbari (editors), Mediterranean Chromosome Number Reports, Fl. Medit. 12.

Gamisans, J. 1977. La végétation des montagnes corses. Deuxième partie. Phytocoenologia 4: 35–131.

Gussone, J. 1826. Plantae Rariores quas in Itinere per Oras Jonii ac Adriatici Maris et per Regiones Samnii et Aprutii. Ex Regia Typographia, Neapoli.

———. 1828. Flora Siculae Prodromus 2. Ex Regia Typographia, Neapoli.

Haslam, S. M., P. D. Sell & P. A. Wolseley. 1977. A Flora of the Maltese Islands. Malta Univ. Press, Msida.

IUCN. 2001. IUCN Red List Categories and Criteria. Version 3.1. IUCN, Gland, Switzerland.

IUCN. 2003. Guidelines for application of IUCN Red List Criteria at Regional Levels, Version 3.0. IUCN, Gland, Switzerland.

Klein, J. C. 1972. Le Genisteto-Carlinetum macrocephalae ass. nov. de l'étage montagnard et le Ligusticetum corsici ass. nov. de l'étage subalpin des massifs du Cinto et du Campotile orientale. Vegetatio 25: 311–333.

Linnaeus, C. 1753. Species Plantarum, 1st ed. Impensis Laurentii Salvii, Holmiae.

Molinier, R. 1960. Étude des groupements végétaux du Cap Corse. Bull. Mus. Hist. Nat. Marseille 19: 1–75.

Oberdorfer, E. 1954. Nordaegaeische Kraut- und Zwergstrauchfluren im Vergleich mit den entsprechenden Vegetationseinheiten des westlichen Mittelmeergebietes. Vegetatio 5/6: 88–96.

Peruzzi, L. & G. Cesca. 2002. Chromosome numbers of flowering plants from Calabria, S Italy. Willdenowia 32: 33–44.

Pignatti, S. 1982. Flora d'Italia. Edagricole, Bologna.

Rivas-Martínez, S., T. E. Díaz, F. Fernández-González, J. Izco, J. Loidi, M. Lousa & A. Penas. 2002. Vascular plant communities of Spain and Portugal. Itinera Geobot. 15(1): 5–432.

Runemark, H. 1969. Reproductive drift, a neglected principle in reproductive biology. Bot. Not. 122: 90–129.

Sibthorp, J. & J. E. Smith. 1832. Flora Graeca 7, plate 683. Richardi Taylor et Socii, Londini.

Sommier, S. & A. Caruana Gatto. 1915. Flora Melitensis Nova. Stabilimento Pellas, Firenze.

Turland, N. J. & C. E. Jarvis. 1997. Typification of Linnaean specific and varietal names in Leguminosae (Fabaceae). Taxon 46: 457–485.

Zohary, M. 1955. Geobotany. Hakibbutz Ha'arzi, Merhavya, Jerusalem, Israel.

A New Species of *Cytinus* (Cytinaceae) from South Africa and Swaziland, with a Key to the Southern African Species

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Abstract. A new species of *Cytinus* L., *C. visseri* Burgoyne, a root holoparasite from Limpopo and Mpumalanga Provinces of South Africa and from Swaziland is described. Morphological and phenological differences separate it from the two existing South African species. The distributional range of *C. visseri* is also highly disjunct compared to that of the other two species, and the species is considered vulnerable (VU D2). Fruit morphology is described in detail for the new species; this is a first for the genus, as previous descriptions were based on flowering material only, and therefore fruit comparisons to the other South African species are not yet possible. A key to all known southern African species is given.

Key words: Cytinaceae, *Cytinus*, holoparasite, IUCN Conservation Status, Rafflesiaceae, South Africa, Swaziland.

A parasitic plant was found on the Long Tom Pass (Mpumalanga Province) in January 2001. Initially mistaken for a member of *Hyobanche* L. or *Orobanche* L. (Orobanchaceae), it was shown on closer examination to be a new species of *Cytinus* L. The genus comprises about ten species of root holoparasites occurring disjunctly in the Mediterranean region, southern Africa, and Madagascar. Traditionally placed in Rafflesiaceae, modern phylogenetic systems recognize *Cytinus* as belonging to a separate family, Cytinaceae, placed in order Malvales (Nickrent, 2002; Nickrent et al., 2004; Stevens, 2001). The family Cytinaceae comprises two genera, *Bdallophyton* Eichler from Central America (Nickrent, 1997) and *Cytinus*, the only genus representing this family in southern Africa. There are two centers of diversity for *Cytinus*: one around the Mediterranean and the other in southern Africa and Madagascar (Nickrent, 1997). Plants from the Northern Hemisphere are monoecious with flowers that are generally shades of yellow, while plants from the Southern Hemisphere are dioecious with flowers that are shades of red.

Cytinus visseri was first noted by Visser (1981) as a new species, but was never described by him because of his untimely death; it has since been collected occasionally in the northern provinces of South Africa and in Swaziland. Information is provided here, for the first time, on the fruit morphology for the genus from southern Africa.

Features of the Southern African Members of the Genus *Cytinus*

Plants of *Cytinus* in southern Africa are small and, if not for the bright crimson of the inflorescence axis borne just above the soil surface, could be easily overlooked. Two species (Jordaan, 2000) have been recognized: *Cytinus capensis* Marloth and *C. sanguineus* (Thunberg) Fourcade. In the past, distinguishing characters for these two species have not been clear, with Oliver (1967) suggesting they may be varieties of one species. In a recent publication (Goldblatt & Manning, 2000), *C. capensis* was considered to be a synonym of *C. sanguineus*.

Examination of specimens of all taxa revealed that *Cytinus capensis* has four perianth lobes (seldom more) that are deep wine-red, as can be seen from the plate in Marloth (1913: plate 43) comparing the two taxa (*C. sanguineus* and *C. capensis*). The flowers of *C. capensis* are shallower, with perianth lobes 8–12 mm long and 7–13 mm wide. Flowers of *C. sanguineus* generally have six perianth lobes (sometimes five), are orange or vermilion (the most common color) to a deeper red, and are generally longer and more slender than those of *C. capensis*, with lobes 6–32 mm long and 4–23 mm wide. The tops of the staminodial columns in *C. capensis* and *C. sanguineus* are tipped by single horn-like projections, while those of *C. visseri* are tipped by multicellular, forked, antler-like projections. While *C. sanguineus* is generally widespread in diverse habitats in the western, northern, and eastern Cape Provinces, *C. capensis* is confined to the Cape Peninsula and seemingly grows only on hosts in deep coastal sands. Perianth lobes of *C. capensis*, *C. sanguineus*, and *C. visseri* are laciniate at the margins and tips. In *C. capensis* and *C. visseri* the surfaces of the perianth lobes are densely covered in multicellular, appressed hairs. In contrast, the perianth lobes in *C. sanguineus*

sometimes have only a few multicellular, appressed hairs but are mostly smooth.

Locally, members of *Cytinus* are not host-specific and are found on roots of woody shrubs, favoring members of Asteraceae (Oliver, 1967), although our examination of numerous specimens has shown that many other plant taxa are involved. In the case of the new species, woody shrubs, mostly *Helichrysum reflexum* N. E. Brown (Asteraceae), but also *Cliffortia repens* Schlechter (Rosaceae) and *Phylica paniculata* Willdenow (Rhamnaceae), can be hosts. The peak flowering time of the parasite coincides with the peak flowering time of the host in the case of *H. reflexum* (*Burgoyne 8173* in sched.). A large population of *C. visseri* has been found at Long Tom Pass. The density of ca. 61 plants per 500 m^2 is considerably higher than for the *Cytinus* species observed in the Cape, which grow only sparsely. This has provided unsurpassed material for the study of this taxon, including further studies on pollination and seed dispersal.

Male and female inflorescences in *Cytinus visseri* are always found on separate host plants (Visser, 1981), and recent observations support this claim.

Distribution and Phytogeography

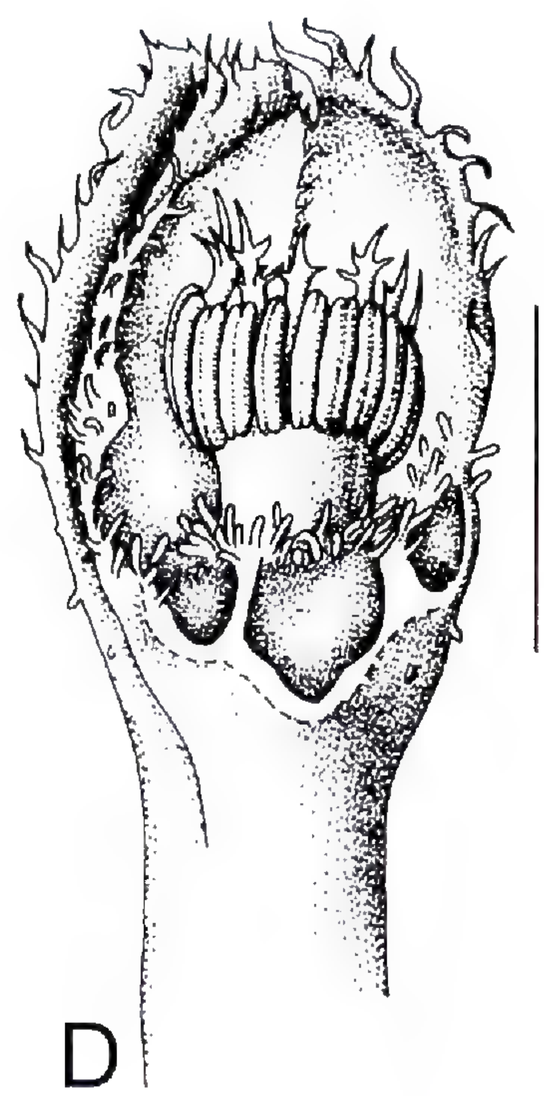
The distributions of *Cytinus capensis* and *C. sanguineus* are centered in the Cape Floristic Region, with that of *C. sanguineus* stretching from around Nieuwoudtville to the Cape Peninsula and eastward to just past Port Elizabeth, with one plant found at Middelburg (Eastern Cape). *Cytinus capensis* is found only on the Cape Peninsula. Herbarium records are scant, possibly owing to the inconspicuous, cryptic nature of the plants, as well as to irregular flowering, which was observed in 2002 and 2003 when drought conditions prevailed.

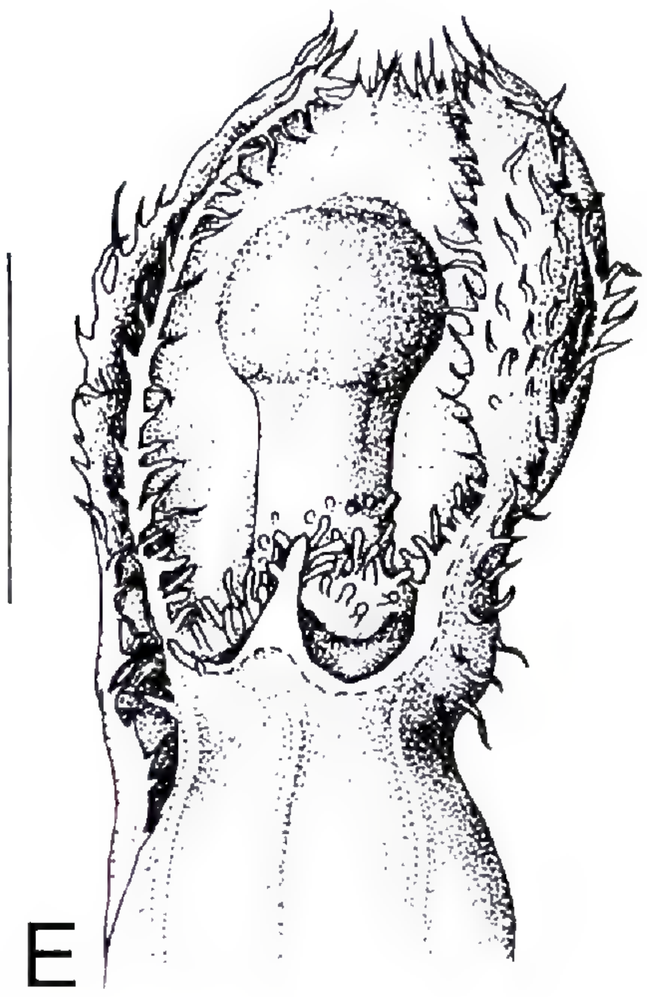
Cytinus visseri occurs in the Limpopo (Visser, 1981) and Mpumalanga Provinces of South Africa and in Swaziland. Geographically and phenologically it differs from the other species mainly in its northern distribution and in its flowering time, which is much later in the season (January to May) and is probably coupled to rainfall (*C. capensis* and *C. sanguineus* flower mainly in August). The deep crimson floral color of *C. visseri* is characteristic, as the flowers of *C. sanguineus* tend to be more vermilion. The flowers of *C. capensis* (Marloth, 1912), however, are also deep red, making it closer to the new species than to *C. sanguineus*. Despite Oliver's (1967) claims to the contrary, receptacular pouches are present in the new species and produce copious amounts of nectar (over 100 µl per flower).

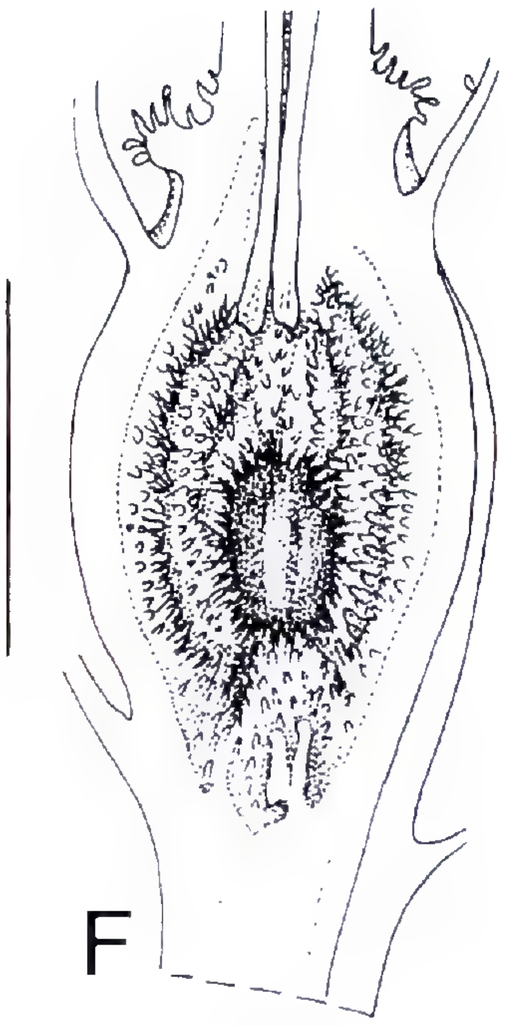
Cytinus visseri Burgoyne, sp. nov. TYPE: South Africa. Mpumalanga Prov.: Lydenburg Distr., 15 April 2001, *Burgoyne 8173* (holotype, PRE; isotypes, BOL, K, MO). Figures 1, 2.

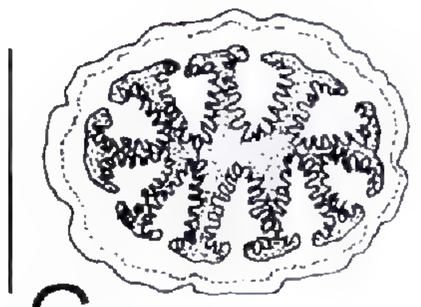
Haec species *C. sanguineo* et *C. capensi* similis sed florescentia inter Januarium et Maium, habitatione in parte septentrionali Africae Australis, prominentiis multicellularibus ramosis in apice columnae antherarum (in speciebus aliis desunt) differt; arctius *C. capensi* propter flores atrorubros similis sed floribus sexpartitis non quadripartitis differt.

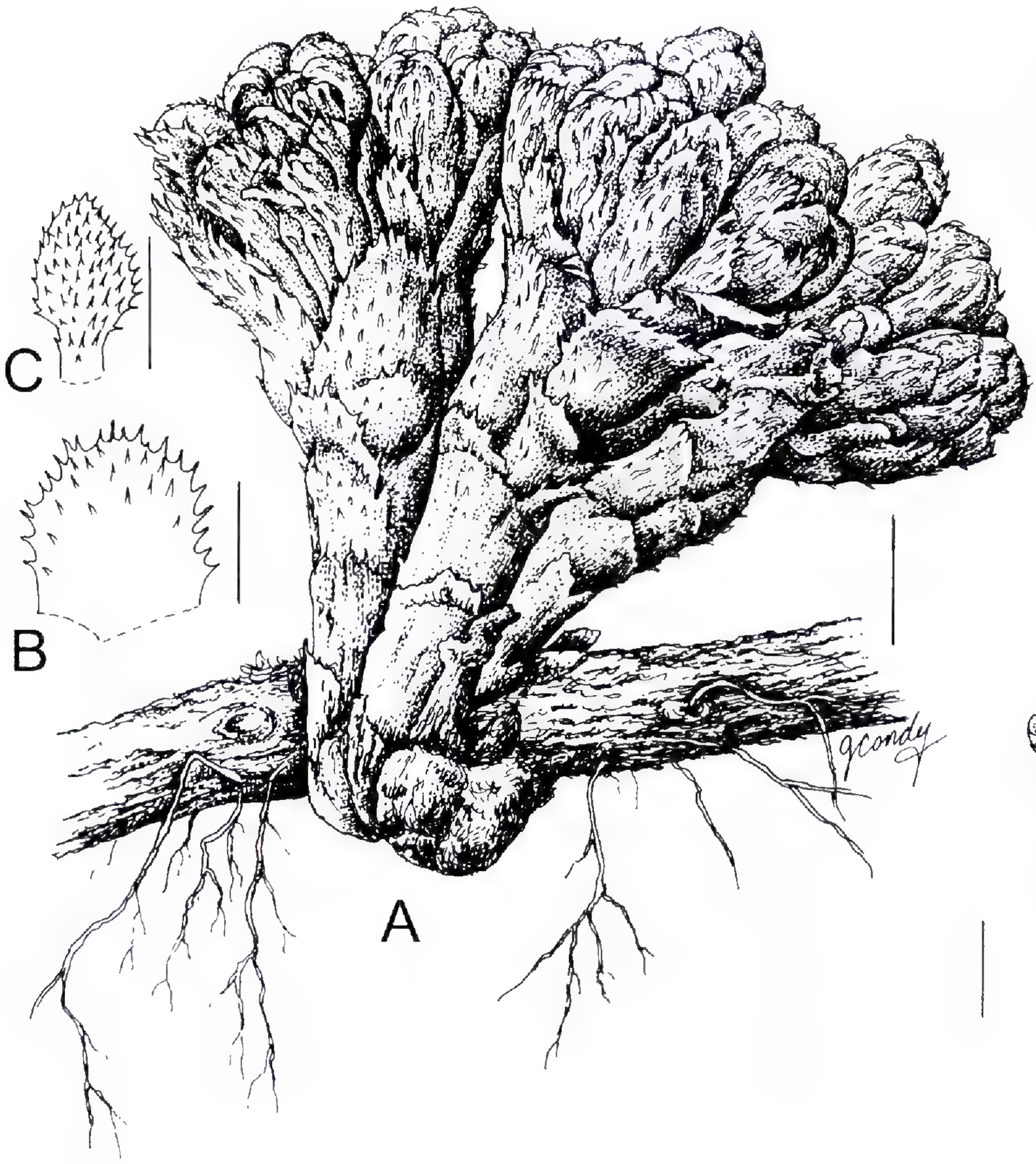
Perennial, upright, dioecious root holoparasite on woody species, male and female plants occurring on different individual host plants, color deep crimson; true roots absent but forming endophytic strands of cells within the tissue of host plants; inflorescence axis borne underground, branched or single; inflorescence formed by cells at the outer surface of the endophyte differentiating into an inflorescence primordium, growing, eventually bursting through the root epidermis of host forming buff-colored fleshy tissue growing upright to the soil surface, red upon emerging from soil; bearing red flowers at tips, underground parts not exposed to light remaining uncolored; inflorescence scales few, spiral, imbricate; surface smooth and buff-colored when borne underground, with multicellular appressed hairs and turning crimson upon appearing above ground; margins, laciniate (ragged); inflorescences with solitary flowers or in 1- to 16(21)-flowered racemes, female inflorescences with up to 16 carpellate flowers, male inflorescences with up to 21 staminate flowers; inflorescence axes indeterminate, developing centripetally, 30–120 mm; bracteoles 1 or 2 per flower, bright crimson, 1.2–3.1 mm, with appressed hairs few or absent in central part; flowers with petals absent; perianth as one whorl comprising (5)6 tepals per flower; tepals 12–16 mm long, bright crimson, covered with multicellular, appressed hairs, laciniate, basally imbricate, with a hinge-like fold; *carpellate flowers* ovary inferior, epigynous, with a stout column terminated by a globose, viscous stigma with a velvety surface, with 6 receptacular pouches below these lined by blunt glandular hairs, nectariferous, ovary unilocular, forming a swelling at base of the flower, placentation intrusive parietal with 6 to 11 placental lobes; *staminate flowers* more slender than carpellate flowers, stamens fused into a column 12–14 mm diam., anthers united into a stout ring, pollen loculi 9 to 16, bithecous, extrorse, dehiscing longitudinal, with 6 receptacular nectariferous pouches lined with numerous blunt glandular hairs, top of staminal column tipped by multicellular antler-like projections; *pollen* pale, cream or white borne in tetrads; *fruit* a fleshy berry 12–17.1 mm diam. with a jelly-like











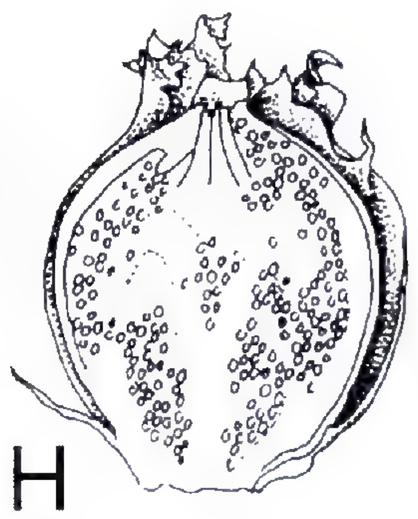


Figure 1. *Cytinus visseri* Burgoyne. —A. Habit of parasite. —B. Bract. —C. Perianth lobe. —D. Staminate flower with foremost perianth lobes removed. —E. Carpellate flower with foremost perianth lobes removed. —F. Longitudinal section through ovary. —G. Transverse section through fruit. —H. Longitudinal section through fruit. —I. Fruit. A–I from *Burgoyne 8173*. Drawn by G. Condy. All scale bars = 1 cm.

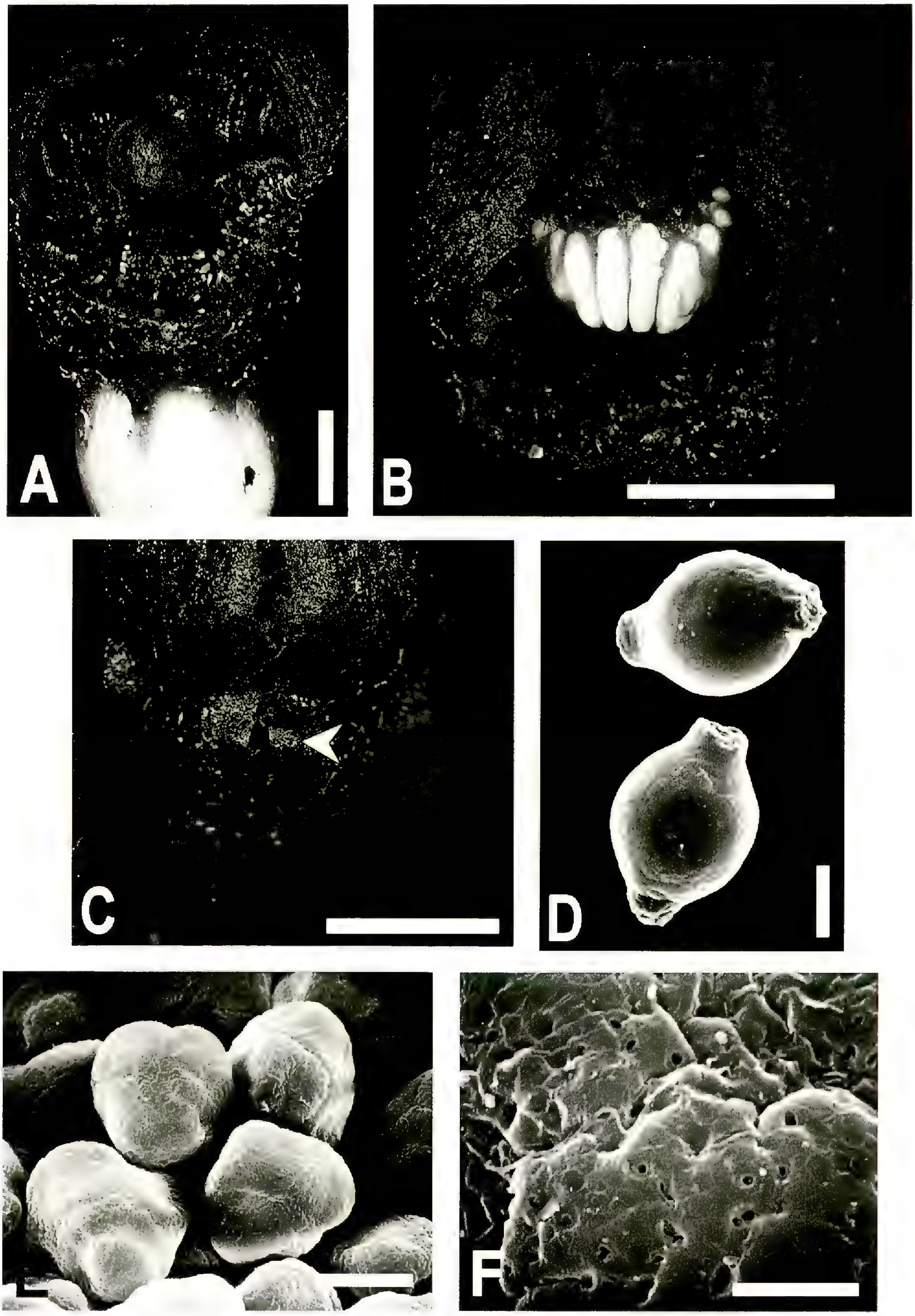


Figure 2. *Cytinus visseri* Burgoyne. —A. Carpellate flowers with foremost perianth lobes removed. Scale bar = 5 mm. —B. Staminate flower with foremost perianth lobes removed. Scale bar = 6 mm. —C. Base of perianth lobes, showing a hinge-like fold. Scale bar = 5 mm. —D. Ureeolate seeds with smooth surfaces. Scale bar = 125 µm. —E. SEM micrograph of pollen, critical point dried tetrads. Scale bar = 21 µm. —F. Pollen surface. Scale bar = 4 µm.

center, falsely 6- to 14-locular; *seeds* numerous, surrounded by a jelly-like substance in fruit center, urceolate, 0.2–0.4 mm long, surface smooth, ripening in winter.

Distribution and habitat. *Cytinus visseri* is known only from South Africa and Swaziland from rocky sandstone outcrops, ca. 1400–2000 m above sea level from no more than four localities.

Phenology. Racemes were observed annually from January to May; fruits ripening in May to July.

Conservation status. *Cytinus visseri* has been evaluated as VU D2 (Vulnerable with a limited distribution; IUCN, 2000), and the individuals were not abundant where collected. An exception to this is the population at Long Tom Pass, but numbers of plants are not constant, as for two years (2003–2004) no plants were found there because of drought.

Etymology. The species is named in honor of Johannes [Johann] Hendrik Visser (1931–1989), South African plant physiologist and expert on parasitic plants, who first recognized this taxon as a new species.

Paratypes. SOUTH AFRICA. **Mpumalanga Prov.:** Lydenburg Distr., Long Tom Pass, Mauchsberg, at top of Pass, *P. M. Burgoyne 8184* (PRE); *P. M. Burgoyne & S. Smithies 1* (PRE); *M. Mort 05.190* (PRE); Mount Anderson, *A. A. Mauve 4637* (PRE). **Limpopo Prov.:** Pietersburg [Polokwane] Distr., Helpmekaar River, Haenertsburg Mtns., 23 March 1936, *E. A. Thompson & H. H. Mockford s.n.* (PRE); Zoutpansberg Distr.: Louis Trichardt, 27 March 1953, *B. G. Mackay s.n.* (NBG). SWAZILAND. Mbabane, near spring, *R. J. Rodin 4528* (PRE).

Key to the Southern African Species of *Cytinus*

1a. Flowers produced from July to September; projections at the top of staminodial column single, horn-like; western, northern, or eastern Cape Provinces, South Africa 2

1b. Flowers produced from January to May; projections at the top of staminodial column multicellular, forked, and antler-like; northern South Africa Limpopo and Mpumalanga Provinces, Swaziland . . . . . *C. visseri*

2a. Perianth lobes mostly 6, vermilion orange, or deeper red, 6–32 × 4–23 mm, mostly smooth, sometimes with few multicellular appressed hairs; widespread in western, northern, or eastern Cape Provinces, South Africa . . . . . *C. sanguineus*

2b. Perianth lobes 4 (seldom more), deep wine-red, sometimes almost black, 0.8–1.2 × 0.7–1.3 mm, densely covered in multicellular appressed hairs, restricted to Cape Peninsula, hosts growing on deep coastal sands . . . . . *C. capensis*

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Literature Cited

Bouman, F. & W. Meijer. 1994. Comparative structure of ovules and seeds in Rafflesiaceae. Pl. Syst. Evol. 193: 187–212.

Goldblatt, P. & J. [J. C.] Manning. 2000. Cytinaceae. Cape plants. A conspectus of the Cape flora of South Africa. Strelitzia 9: 420. National Botanical Institute, Pretoria, Missouri Botanical Garden, St. Louis, Missouri.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Jordaan, M. 2000. Rafflesiaceae. *In* O. A. Leistner (editor), Seed plants of southern Africa: Families and genera. Strelitzia 10: 462. National Botanical Institute, Pretoria.

Marloth, R. 1912. Some new South African succulents and other plants, Part IV. Trans. Roy. Soc. South Africa 2: 237–238.

———. 1913. Rafflesiaceae, Tribe Cytineae. Pp. 174–176 *in* The Flora of South Africa with Synoptical Tables of the Genera of the Higher Plants, Vol. 1. Darter, Cape Town.

Nickrent, D. L. 1997 [and update]. The parasitic plant connection, Cytinaceae. Southern Illinois University, Carbondale, URL: <http://www.parasiticplants.siu.edu/>, accessed 19 June 2006.

———. 2002. Orígenes filogenéticos de las plantas parásitas. Pp. 29–56 *in* J. A. López-Sáez, P. Catalán & L. Sáez (editors), Plantas Parásitas de la Península Ibérica e Islas Baleares. Mundi-Prensa, Madrid.

———, A. Blarer, Y-L. Qiu, R. Vidal-Russell & F. E. Anderson. 2004. Phylogenetic inference in Rafflesiales: The influence of rate heterogeneity and horizontal gene transfer. BioMed Centr. Evol. Biol. 4: 40.

Oliver, E. G. H. 1967. *Cytinus sanguineus*. The Flowering Plants of Africa 38: tab. 1486.

Stevens, P. F. 2001 [and update]. Angiosperm Phylogeny Website, ver. 6, May 2005. URL: <http://www.mobot.org/MOBOT/research/APweb/>, accessed 19 June 2006.

Visser, J. 1981. 56–63 *in* Rafflesiaceae. South African Parasitic Flowering Plants. Juta, Cape Town.

Una Especie Nueva de *Thompsonella* (Crassulaceae) del Estado de Michoacán, México

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Resumen. Se describe como especie nueva e ilustra a *Thompsonella garcia-mendozae* P. Carrillo & Pérez-Calix, a partir de ejemplares originarios de la parte media y baja de la Cuenca del Río Balsas, en el sur del estado de Michoacán, México. La nueva especie es la única del género que lleva las hojas con ápices aristados en su juventud y márgenes hialinos, así como los sépalos recurvados en el ápice. Por otra parte, esta planta se asemeja a *T. platyphylla* Rose y a *T. colliculosa* Moran, de las que se diferencia en que sus cincinos inferiores miden hasta 6.5 cm y presentan 4 a 18 flores en pedicelos de 3 mm de largo, mientras que en *T. platyphylla* y en *T. colliculosa* los cincinos miden a lo más 3 y 5 cm de largo respectivamente y llevan hasta 12 flores sobre pedicelos de 1 mm de largo. Por último, se presenta una clave para la identificación de las especies conocidas de *Thompsonella*.

Abstract. A new species, *Thompsonella garcia-mendozae* P. Carrillo & Pérez-Calix, is described and illustrated. This taxon occurs in the Balsas River Basin of southern Michoacán, Mexico. The new species is unique in the genus *Thompsonella* by possessing young leaves with an aristate apex and hyaline margin, as well as sepals with a recurved apex. It is similar to *T. platyphylla* Rose and *T. colliculosa* Moran, from which it is distinguished by the possession of the lower cincinni up to 6.5 cm long and with 4 to 18 flowers. Furthermore, the flowers have pedicels up to 3 mm long. In *T. platyphylla* and *T. colliculosa* the cincinni are up to 3 and 5 cm long, respectively, and up to 12 flowers are borne, on pedicels 1 mm long or shorter. A key to the identification of species of *Thompsonella* is provided.

Key words: Crassulaceae, Mexico, Michoacán, *Thompsonella*.

El género *Thompsonella* Britton & Rose (1909) fue propuesto para agrupar a dos especies que no correspondían con ninguno de los géneros previamente descritos. Por casi 90 años el grupo se mantuvo con los taxa iniciales (*T. platyphylla* Rose y *T. minutiflora* (Rose) Britton & Rose) y es hasta la última década en que se han registrado los siguientes cuatro hallazgos de plantas de este conjunto: *T. colliculosa* Moran (1992), *T. spathulata* Kimnach (1993), *T. xochipalensis* Gual, S. Peralta & Pérez-Calix (1997) y *T. mixtecana* J. Reyes & L. López (1998).

Todas las especies de *Thompsonella* son endémicas del suroeste de México, su distribución se restringe a la cuenca del Rio Balsas así como a algunas áreas de la cuenca alta del Rio Papaloapan.

Como resultado parcial del trabajo efectuado para la preparación de una revisión taxonómica del género *Thompsonella*, se encontraron especímenes de una planta que pertenece a este grupo, originarios de la región conocida como "Tierra Caliente," en la porción media y baja de la Cuenca del Río Balsas, en el sur del estado de Michoacán. Este taxon no corresponde con ninguno de los descritos previamente, por ello se propone como especie nueva para la ciencia bajo el siguiente binomio:

Thompsonella garcia-mendozae P. Carrillo & Pérez-Calix, sp. nov. TIPO: México. Michoacán: Laderas al W de El Limoncito, 4.5 km al SE de San Pedro Barajas, mpio. La Huacana; peñascos de rocas ígneas, bosque tropical caducifolio, 100 m, 20 sep. 2002, *E. Pérez y I. Steinmann 1312* (holotipo, IEB; isotipos, MEXU, MO). Figura 1.

Planta perennis, glabra, rhizomatosa; folia in rosula, lanceolata ad obovata in maturite 5–7 cm longa, 2–4 cm lata, apice aristata, margine debile hyalina; inflorescentia

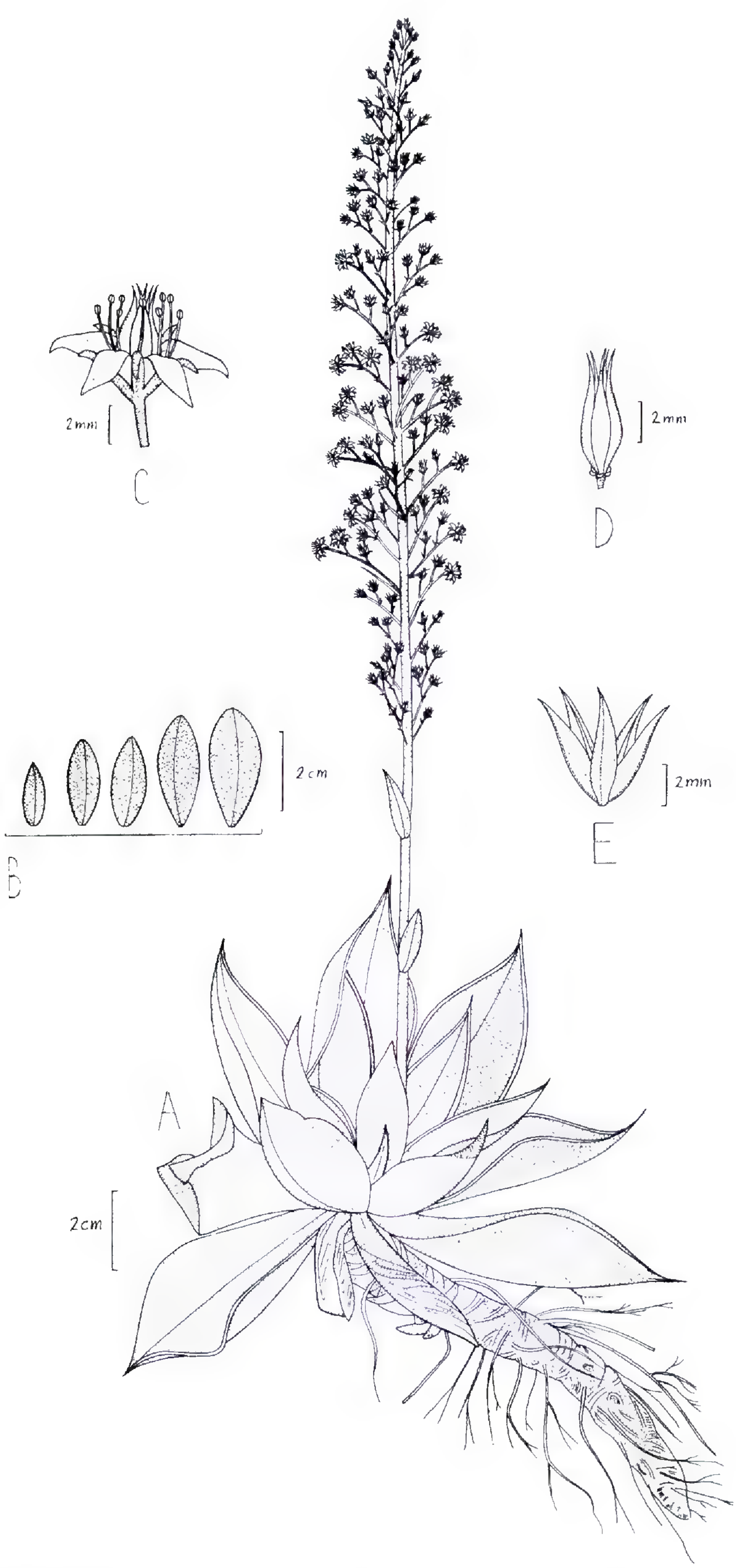

Figura 1. *Thompsonella garcia-mendozae* P. Carrillo & Pérez-Calix. —A. Hábito. —B. Serie de brácteas. —C. Flor. —D. Ginecceo. —E. Fruto. Dibujo realizado por Rogelio Cárdenas Soriano a partir del ejemplar tipo, *Perez y Steinmann 4312* (IEB).

thyrsiformis, 20–35 cm longa, cincinni inferiores 1–6.5 cm longi, flores in cincinno (4–)9–12(–18), pedicellati, ca. 9 mm diametro; sepala subaequalia, lanceolata, 4–6.5 mm longa, 1.8–2 mm lata, apice acuminata. *Thompsonella garcia-mendozae* est unica species cognita generis *Thompsonellae* cum foliis ad apicem aristatis, ad margines juventute hyalinis et cum sepalis ad apicem curvatis. Taxon novum *T. platyphyllae* et *T. colliculosae* simile sed cincinnis usque 6.5 cm longis, 4–18 flores ferentibus cum pedicellis ca. 3 mm longis. Cincinni ultimarum specierum usque 3 et 5 cm

longi, minus quam 12 flores ferentes cum pedicellis ca. 1 mm longis.

Planta herbácea perenne, glabra, de hasta 35 cm de alto (incluyendo la inflorescencia); tallo rastrero, rizomatoso, hasta de 15 cm de largo y 1.5 cm de diámetro, cubierto por raíces adventicias de color cobrizo y por los restos de las hojas viejas. Hojas dispuestas en roseta basal de 10–12 cm de diámetro, láminas ascendentes, oblanceoladas en la juventud, obovadas en la madurez, de 5–7 × 2–4 cm, ca. 0.5 cm de grueso cerca de la base, ápice aristado en las hojas jóvenes, glabras, glaucas, suculentas, de color verde claro, algo aquilladas en el envés, margen entero y ligeramente hialino, en ocasiones con una pequeña muesca cerca del ápice. Pedúnculo erecto, hasta de ca. 35 cm de largo (incluyendo la inflorescencia) y de 0.4 cm o menos de grueso cerca de la base; brácteas oblanceoladas a obovadas u obovado-oblongas, de (1–)2.2–3 × (0.2–)0.8–1.3 cm, ca. 3 mm de grueso, aplanadas y con frecuencia aquilladas dorsoventralmente, ápice acuminado o aristado, base truncada, espolonada. Inflorescencia tirsiforme, de 20–35 cm de largo (incluyendo el pedúnculo), con 20 o más ramas cinciniformes, las inferiores de 4–6.5 cm de largo, con (4)9 a 12(18) flores cada una. Flores de ca. 9 mm de diámetro, pedicelos de 2–3 mm de largo; sépalos 5(6), subiguales, lanceolados, de 4–6.5 mm de largo por 1.5–2 mm de ancho, ápice acuminado, recurvado; pétalos en igual número que sépalos, lanceolados, de 5–6.5 × 1.8–2 mm, ápice acuminado, la haz blanca con líneas pardo-rojizas o totalmente de color rojo oscuro en los 3/4 distales, de 6–6.5 mm de largo; estambres dos veces más numerosos que sépalos, filamentos filiformes, anteras subcirculares, de ca. 0.5 mm de largo y 0.6–0.8 mm de ancho, rojizas, amarillas en dehiscencia, nectarios de 0.5 mm de largo; ginecco de 5(6) carpelos, de 5–6 × 2–2.2 mm. Folículos de 6.5 × ca. 1 mm, rojizos; semillas de 0.5 × 0.2 mm, de color café-amarillento.

A grandes rasgos, en el género *Thompsonella* se pueden diferenciar los siguientes dos grupos: uno que incluye a *T. mixtecana* y a *T. xochipalensis* que llevan tallos aéreos evidentes y presentan hábito sufruticoso; y, otro conjunto conformado por el resto de las especies (*T. colliculosa*, *T. minutiflora*, *T. platyphylla* y *T. spathulata*) que son plantas acaules o llevan un rizoma y presentan hábito arrosetado. *Thompsonella garcia-mendozae* pertenece al segundo conjunto, en el que guarda mayor semejanza con *T. platyphylla* y con *T. colliculosa*. A esta última se asemeja en la superficie extendida de los pétalos de color rojo. Discrepa de ambas en que *T. garcia-mendozae* presenta cincinos de hasta 6.5 cm con 4 a 18 flores y en que las flores llevan un pedicelo de 3 mm, mientras que en las otras dos especies los cincinos llevan a lo más 12 flores con pedicelos de menos de 1 mm de largo o son sésiles. Además se trata de la única especie conocida de *Thompsonella* que posee hojas con ápices aristados en su juventud y márgenes hialinos; así como sépalos recurvados en el ápice.

Por otra parte, *Thompsonella garcia-mendozae* es el único miembro del género en el que se han registrado de manera ocasional flores hexámeras, carácter que es más frecuente en el género *Sedum* L.

Distribución y habitat. *Thompsonella garcia-mendozae* se conoce de los municipios de La Huacana y de Múgica (Nueva Italia), en el sureste de Michoacán, tal distribución geográfica marca un nuevo límite occidental conocido para el género. Habita en cantiles formados por rocas ígneas y conglomerados. La vegetación corresponde al bosque tropical caducifolio formado por especies de los géneros *Pilosocereus* Byles & G. D. Rowley, *Bursera* Jacquin ex L., *Stenocereus* Riccobono, *Hechtia* Klotzsch, *Agave* L., *Mammillaria* Haworth y *Talinum* Adanson entre otros. La altitud en que se han localizado las poblaciones va de 400 a 500 m, lo que constituye el límite inferior de distribución altitudinal registrado para las especies de *Thompsonella*. El clima de la región corresponde al semiseco con lluvias en verano (García, 1973).

Etimología. El epíteto específico del nuevo taxón honra a Abisaí García Mendoza, investigador del Jardín Botánico Exterior de la Universidad Nacional Autónoma de México, destacado estudioso de la familia Agavaceae y prolífico colector; quien además, fue el primer botánico que localizó las poblaciones de la nueva especie.

Paratipos. MÉXICO. **Michoacán:** Cañón del Marqués, mpio. Múgica (Nueva Italia), *M. Soto y C. Glass 36* (IEB), *P. Carrillo-Reyes y E. Pérez 3186* (IEB), *E. Pérez 4315* (IEB); El Limoncito, mpio. La Huacana, *I. García-Mendoza, J. Utley y K. Burt-Utley 1803* (MEXU); laderas al W de El Limoncito, 1.5 km al SE de San Pedro Barajas, mpio. La Huacana, *E. Pérez, E. Carranza y V. Steinmann 1245* (IEB).

Clave para las Especies de *Thompsonella*

1a. Plantas de porte sufruticoso, con tallo aéreo evidente.
  2a. Tallo monopódico, rara vez ramificado; hojas linear lanceoladas o ensiformes, de 2.5–5.5 mm de ancho . . . . . *T. xochipalensis*
  2b. Tallo ramificado; hojas obovadas a oblanceoladas, de 12–15(–22) mm de ancho . . . . . *T. mixtecana*
1b. Plantas de porte herbáceo, arrosetadas, acaules, o de tener tallo, éste rizomatoso, o menor de 3 cm de largo.

3a. Cincinos inferiores de la inflorescencia generalmente compuestos por menos de 4(a 6) flores; hojas de menos de 2.5 cm de ancho.
  4a. Hojas espatuladas, márgenes redondeados en sección transversal, nunca crenados. Plantas conocidas de altitudes inferiores a 1500 m. . . . . *T. spathulata*
  4b. Hojas oblongas u oblanceoladas, márgenes agudos en sección transversal, ocasionalmente crenados. Plantas conocidas de altitudes superiores a 1500 m . . . . . *T. minutiflora*
3b. Cincinos inferiores de la inflorescencia compuestos por 5 o más flores; hojas generalmente de más de 2.5 cm de ancho.
  5a. Hojas de color verde oscuro, nunca glaucas ni pruinosas, la base conspicuamente acanalada; tirso compacto, flores sésiles o subsésiles; plantas conocidas de la zona limítrofe entre los estados de México y Michoacán . . . . . *T. colliculosa*
  5b. Hojas de color verde glauco o verde grisáceo, generalmente pruinosas, la base de las hojas no conspicuamente acanalada; tirso laxo, flores claramente pediceladas.
    6a. Hojas de color verde grisáceo o purpúreo, márgenes ocasionalmente rojizos, ápice de las hojas jóvenes agudo; cincinos con (4)5 a 10 flores, sépalos erectos . . . . . *T. platyphylla*
    6b. Hojas de color verde glauco, márgenes nunca rojizos, ligeramente hialinos, ápice de las hojas jóvenes aristado; cincinos de (4)9 a 12(18) flores; sépalos recurvados. . . . . *T. garcia-mendozae*

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Literatura Citada

Britton, L. N. & J. N. Rose. 1909. *Thompsonella*, a new genus of Crassulaceae from Mexico. Contr. U.S. Natl. Herb. 12: 391–392, pls. 44–45.

García, E. 1973. Modificaciones al Sistema de Clasificación Climática de Köppen. Instituto de Geografía, Universidad Nacional Autónoma de México.

Gual, M., S. Peralta & E. Pérez-Calix. 1997. Una nueva especie de *Thompsonella* (Crassulaceae) del Estado de Guerrero, México. Acta Bot. Mex. 40: 37–42.

Kimnach, M. 1993. *Thompsonella spathulata*, a new species from Oaxaca. Cact. Succ. J. (U.S.) 65: 41–43.

Moran, R. 1992. *Thompsonella* Britton & Rose (Crassulaceae) with *T. colliculosa*, a new species. Cact. Succ. J. (U.S.) 64: 37–44.

Reyes, J. & L. López. 1998. *Thompsonella mixtecana*, una nueva especie de Oaxaca, México. Cact. Suc. Mex. 43: 27–30.

Wigandia ecuadorensis (Hydrophyllaceae), una Nueva Especie del Bosque Muy Seco Tropical al Occidente de Ecuador

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Resumen. Se describe *Wigandia ecuadorensis* Cornejo, una nueva especie de arbusto o arbolillo, endémica del fragmentado y disturbado bosque muy seco tropical, en la provincia de Manabí, en la costa del Ecuador. Es parecida a *W. urens* (Ruiz & Pavón) Kunth s.l., de la que difiere por presentar ovarios más grandes (5–8 mm vs. 3–4 mm); estilos de mayor longitud (16–28 mm vs. (4–)6–12(–15) mm); estambres con filamentos completamente glabros versus provistos de pelos híspidos, patentes a retrorsos; y corolas más grandes (2–3.5 cm), con lóbulos divergentes versus corolas más pequeñas (1.2–1.5(–2) cm), con lóbulos patentes a más o menos reflexos. Por sus cualidades de colonizadora subleñosa y elevada tolerancia a los bajos niveles de precipitación, esta nueva especie podría ser utilizada para recuperar la vegetación nativa, y para protección de suelos poco consolidados en las áreas de bosque muy seco tropical de la costa de Ecuador y la adyacente esquina noroccidental de Perú.

Abstract. *Wigandia ecuadorensis* Cornejo is a new shrubby to treelet species restricted to the fragmented and disturbed tropical dry forests in the province of Manabí, on the coast of Ecuador. It is somewhat similar to *W. urens* (Ruiz & Pavón) Kunth s.l. but differs by having larger ovaries (5–8 mm vs. 3–4 mm), longer styles (16–28 mm vs. (4–)6–12(–15) mm), filaments completely glabrous versus pubescent with patent to retrorse hispid trichomes, and larger corollas (2–3.5 cm) with divergent lobes versus smaller ones (1.2–1.5(–2) cm) with patent to more or less reflexed lobes. This new species is a subwoody colonizer in sunny, open places, having a high tolerance to low moisture levels; it may be used to recover the native vegetation and also to protect the loose soils in the very dry tropical forest life zone of coastal Ecuador and northwesternmost Peru.

Key words: bosque muy seco tropical, Ecuador, Estuario del Río Chone, Hydrophyllaceae, *Wigandia*.

Wigandia Kunth es un pequeño género perteneciente a la familia Hydrophyllaceae, endémico de América, distribuido desde México y las Antillas, hasta Venezuela y Perú. Está constituido por cinco especies: (1) *W. reflexa* Brand y (2) *W. pruritira* Sprengel, ambas de corolas blancas hasta amarillas y restringidas a las Antillas; (3) la variable *W. urens* (Ruiz & Pavón) Kunth s.l. (incl. *W. caracasana* Kunth), ampliamente distribuida desde México hasta Colombia y Venezuela, y disyunta a los Andes de Perú (aún no registrada en Ecuador); (4) *W. wurdackiana* Ferreyra, al parecer endémica de la zona Amotape-Huancabamba, al norte de Perú (Berry, 1982; Weigend, 2002); y (5) *W. crispa* (Tafalla ex Ruiz & Pavón) Kunth, restringida en los Andes de Ecuador y Perú, usualmente entre 1600–3000 m (Ferreyra, 1997; Jørgensen & León-Yánez, 1999). Durante la revisión de las Hydrophyllaceae para *Flora of Ecuador* (Cornejo, manuscrito sometido), se encontró la siguiente novedad.

Wigandia ecuadorensis Cornejo, sp. nov. TIPO: Ecuador. Manabí: Bahía de Caráquez, km 12 vía a Tosagua, 50 m, 3 Sep. 2004 (fl), *X. Cornejo 7893* (holotipo, GUAY; isotipos, MO-5909219, QCA, foto en GUAY). Figura 1.

Species affinis *Wigandiae urenti*, a qua differt corolla 2–3.5 cm (vs. 1.5–2 cm) longa, ovariis 5–8 mm (vs. 3–4 mm) longis, stylis 16–28 mm (vs. (4–)6–12(–15) mm) longis; filamentis staminarum glaberrimis (vs. hispidis); fructibus cum pedicellis 3–10 mm (vs. 1–2 mm) longis.

Arbusto o arbolillo monocaule, 1–4 m de alto, hasta 6 cm de diam., densamente cubierto por pelos híspidos que hincan al tacto. Hojas coriáceas (+ cartáceas en seco), ovadas hasta amplio-elípticas, 8–10 × 6–28 cm, base + cordada, ápice obtuso a amplio-obtuso, margen crenado-denticulado, haz con ± densos pelos híspidos, ca. 0.5–3 mm, glabrescente, todos los nervios sulcados, envés híspido-tomentoso, con los nervios primario y secundarios prominentes, en ambos lados la densa pubescencia híspida se encuentra entremezclada con muy cortos e inconspicuos tricomas víscido-capitados y ocasional-

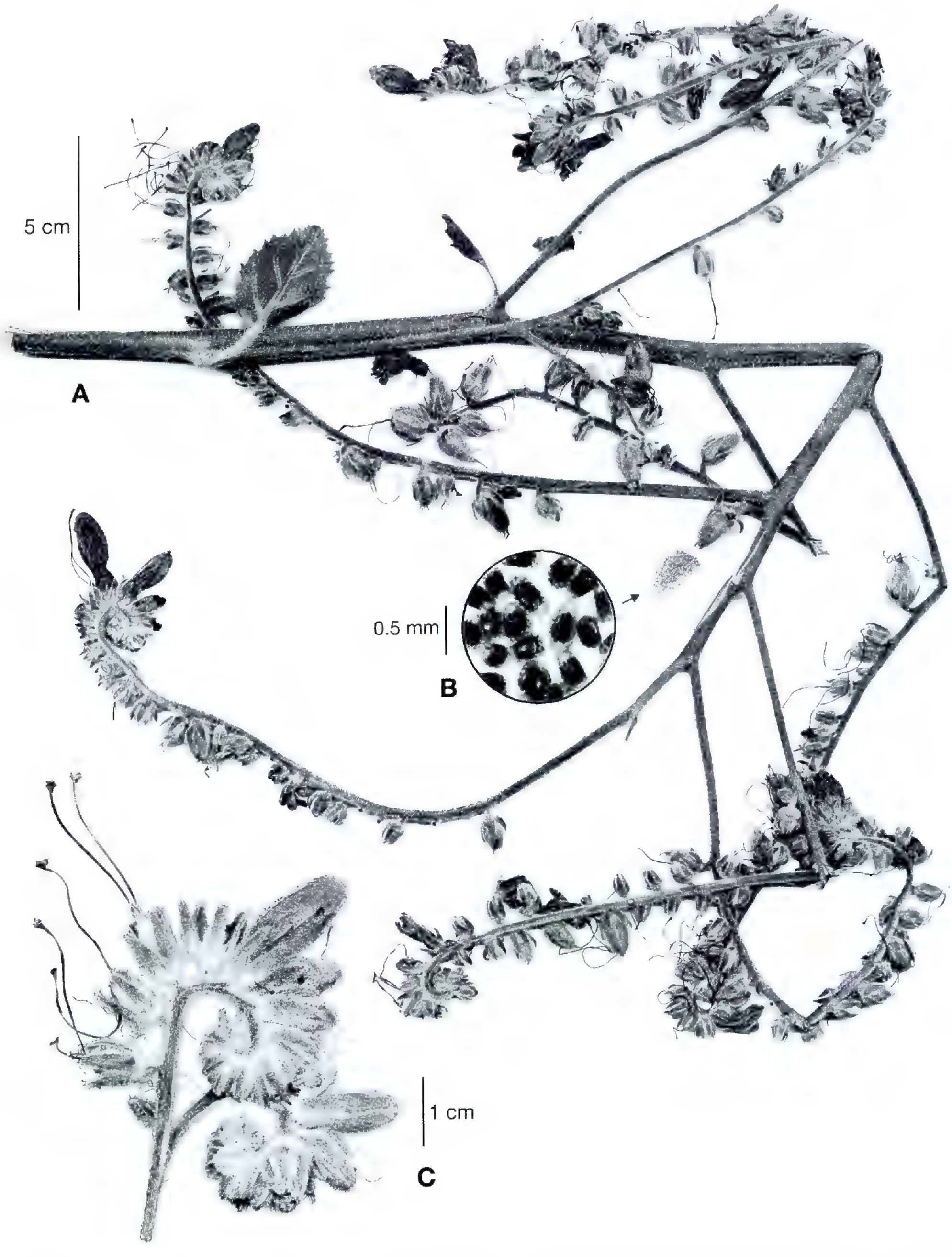

Figura 1. *Wigandia ecuadorensis* Cornejo. —A. Inflorescencia terminal, una panícula de cincinos. —B. Detalle de las semillas. —C. Porción terminal de los cincinos basales, con prefloraciones subcilíndricas y flores en postfloración desprovistas de la corola, mostrando los sépalos, con los 2 estilos expuestos (*Cornejo 7893*, isotipo QCA).

mente muy dispersos pelos delgados y curvos, más largos que los pelos híspidos; 5 a 8 pares de nervios laterales, los basales divergentes, los restantes ± oblicuos hasta algo ascendentes hacia el ápice, nervios terciarios reticulados; peciolos 2.5–15 cm, cubiertos por densos pelos híspidos, ca. 0.5–3 mm. Inflorescencia terminal, inicialmente cimosa, llegando a ser una panícula de cincinos, 10–60 cm, cincinos alternos, laxos, divergentes a patentes, los basales frecuentemente dicótomos, los restantes simples, cada uno 2.5–20 cm, con (1–)3 a 35 flores ebracteadas, en la madurez laxamente dispuestas a lo largo del ráquis; pedicelos 1–4 mm. Prefloraciones oblongas, híspido-tomentosas; cáliz de 5 sépalos persistentes, erectos en la antesis, linear-lanceolados, 5–10 × 1.5–2.6 mm, a veces apenas desiguales (en las flores del mismo

cincino), ápice agudo, margen entero, híspido-tomentosos hacia la base e híspido-tomentulosos y con abundantes y cortos (ca. 0.2 mm) tricomas víscido-capitados hacia el ápice en el lado abaxial, híspido-pilosos a híspido-tomentulosos en el lado adaxial; corola subcilíndrica hasta algo infundibuliforme, anaranjada brillante a café-violeta, 2–3.5 (incl. los lóbulos) × 1.5–2.5 cm (en antesis), 5-lobada, externamente híspido-tomentulosa y con muy cortos tricomas víscido-capitados, glabrescente en el cuarto basal que está cubierto por los sépalos, con ampollas (visibles en las flores hidratadas) en la mitad basal, lóbulos corto-oblongoides, ca. 7–10 × 4–7 mm (ca. 12 × 7 en vivo), ápice amplio obtuso y redondeado; estambres 5, insertos, filamentos 2–3 cm, basalmente adnados al tubo de la corola, completamente glabros, anteras sagitadas, 4–5 mm; ovario ovado a ovado-lanceolado, 5–8 × 3–4 mm, densamente híspido-tomentoso, estilos 2, 1.6–2.8 cm, púrpura (en vivo), híspido-pilosos y con muy cortos tricomas glandulares en la base. Infructescencias con cincinos basales hasta 50 cm de longitud (vistas en campo pero no colectadas); fruto cápsula 2-valvada, en la madurez dehiscente, angosto-ovado, 12–14 × ca. 7 mm, híspido-tomentuloso, sobre un pedicelo recto a apenas curvo, 3–10 mm; semillas numerosas (ca. 200 a 300 por fruto), diminutas, 0.3–0.5 mm de largo, cuerpo de la semilla café, oblongoide o angosto-elíptico hasta redondo o subtriangular, rodeado por un tejido alveolado pardo-hialino.

Fenología. Florece en febrero, abril, junio y septiembre.

El extremo norte del bosque muy seco tropical en Ecuador. La corriente de Humboldt se desplaza en dirección sur-norte, bordeando la costa del Pacífico de América del Sur y condicionando la presencia de los diferentes tipos de bosques secos en la costa de Ecuador. Un poco más al norte del estuario del Río Chone, más o menos a la altura de Cabo Pasado (ca. 0 22′S), en la provincia de Manabí, la corriente de Humboldt gira hacia el oeste, separándose de la costa de Ecuador y constituyendo en la adyacente área continental costera el extremo norte de las zonas de vida de bosque muy seco y seco tropical. Este extremo norte del bosque seco de la costa de Ecuador se encuentra limitado al este (en el área entre el noreste de Chone, Flavio Alfaro y Convento (ca. 80 00′W)) y norte (aproximadamente desde el área de San Juan (ca. 00 08′S)) por las zonas de vida de bosque húmedo y muy húmedo tropical (obs. pers. en campo), cuyos diferentes tipos de suelos y niveles de precipitación (en comparación con el área del estuario del Río Chone), explican porqué *Wigandia ecuadorensis* a pesar de ser una especie colonizadora y dispersa por viento, presenta una distribución restringida. Este extremo norte del bosque muy seco tropical ecuatoriano posee la excepcional ocurrencia de seis especies simpátricas de *Capparis* L. (Capparaceae), que no ha sido encontrada en ningún otro lugar de la región de bosque seco al occidente de Ecuador (Cornejo, 2005), entre ellas la recientemente descrita *C. sclerophylla* Iltis & Cornejo, restringida al bosque seco de la costa de Ecuador y la adyacente esquina noroccidental de Perú, cuyo tipo (*Cornejo & Bonifaz 5822*, GUAY, WIS) proviene de la misma localidad de *W. ecuadorensis*; además de otras endémicas, entre las que se destaca la única población actualmente conocida de la localmente frecuente (al interior de los remanentes boscosos), pero amenazada *Ditaxis macrantha* Pax & K. Hoffmann (*Cornejo & Bonifaz 5843*), Euphorbiaceae cuyo tipo (*Eggers 15557*, US) fue colectado entre Agua Amarga y El Recreo. Detalles adicionales de su común hábitat y vegetación asociada han sido reportados por el autor en Iltis y Cornejo (2005: 433–435).

Categoría de conservación. *Wigandia ecuadorensis* se encuentra amenazada por la ampliación de la frontera agrícola. De acuerdo con los criterios UICN (2001) le corresponde la categoría VU B2ab(iii).

Ecología y usos potenciales. *Wigandia ecuadorensis* es una colonizadora subleñosa de muy bajo requerimiento hídrico, que crece sobre suelos básicos, poco consolidados, a menudo de fuertes pendientes, en lugares abiertos y áreas disturbadas en la zona de vida bosque muy seco tropical. Por sus cualidades de ser una subleñosa de crecimiento relativamente rápido (obs. pers.), en áreas sujetas a una fuerte irradiación lumínica, adaptada a bajos niveles de precipitación (ca. 500 mm) y por poseer hojas de láminas más amplias (en comparación con las restantes especies nativas del bosque muy seco de Ecuador y noroccidente de Perú), y la facilidad para colonizar suelos flojos, *W. ecuadorensis* parece ser una especie apropiada para recuperar la vegetación nativa en áreas muy alteradas (sin mayores inversiones en gastos por agua) del bosque muy seco tropical y talvés se la podría sembrar en cultivos mixtos a altas densidades para proteger los suelos en sitios de similares características en el occidente de Ecuador y la adyacente esquina noroccidental de Perú.

Discusión. *Wigandia ecuadorensis* es vegetativamente parecida a *W. urens*, de la que difiere por presentar estilos de mayor longitud (16–28 mm vs. (4–)6–12(–15) mm); estambres con filamentos completamente glabros versus provistos de pelos híspidos frecuentemente patentes a retrorsos, dispuestos en la

mitad hasta los dos tercios basales; ovarios más grandes (5–8 mm vs. 3–4 mm); corolas más grandes (2–3.5 cm), con lóbulos divergentes versus corolas más pequeñas (1.2–1.5(–2) cm), con lóbulos patentes a más o menos reflexos y frutos maduros con pedicelos 3–10 mm versus sésiles o inconspicuamente pedicelados hasta 2 mm. Difiere notoriamente de *W. crispa* por presentar flores más pequeñas, pediceladas y laxamente dispuestas a lo largo de los cincinos versus flores más grandes, usualmente sésiles y densas, en *W. ecuadorensis* los sépalos miden 5–10 mm, y la corola es anaranjada brillante a café-violeta, 2–3.5 cm de largo, con lóbulos de 4–6 mm de ancho, mientras que en *W. crispa* los sépalos miden 11–20 mm y la corola es verdosa a amarillenta o blanca, 3.5–4.5 cm de largo, con lóbulos 8–12 mm de ancho. La tercera especie de este género en América del Sur es *W. wurdackiana*, la cual, aunque es similar a *W. crispa*, sin embargo es extremadamente diferente de *W. ecuadorensis*, principalmente por sus grandes flores (las más grandes de las *Wigandia*), con sépalos 2.5–3.5 cm, corola campanulada, 5–6.5 cm, de color verdoso o blanco y hojas con márgenes provistos de distintivos y peculiares dientes acuminados más o menos curvos.

Observación. Unas pocas corolas de *Wigandia ecuadorensis* que fueron hidratadas presentan ampollas en la mitad basal, se desconoce si estas ampollas son una característica natural de la especie o si son producidas por algún agente.

Paratipos. ECUADOR. **Manabí:** Bahía de Caráquez, naked earth, *Asplund 16566* (S); Leonidas Plaza, on the road up to Estación Naval, *Sparre 19646* (S); frente a isla Corazón, *Cornejo 1742* (GUAY); La Venta, S of Bahía (de Caráquez), *Játiva & Epling 996* (S); 5 km au sud de Chacras de Manta, zone très sèche, pentes des collines, *Huttel 2085* (QCA).

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Literatura Citada

Berry, P. 1982. The systematics and evolution of *Fuchsia* sect. *Fuchsia* (Onagraceae). Ann. Missouri Bot. Gard. 69: 1–198.

Cornejo, X. 2005. La vegetación del estuario del Río Chone, Provincia de Manabí, Ecuador. Cinchonia 6(1): 87–95.

Ferreyra, R. 1997. Las Hydrophyllaceae en el Perú. Biolania ed. esp. N° 6: 325–330.

Iltis, H. H. & X. Cornejo. 2005. Studies in Capparaceae XXII. *Capparis sclerophylla*, a novelty from arid coastal Peru and Ecuador. Novon 15: 429–437.

Jørgensen, P. M. & S. León-Yánez. 1999. Catalogue of the Vascular Plants of Ecuador. Monogr. Syst. Bot. Missouri Bot. Gard., Vol. 75.

UICN. 2001. Categorías y Criterios de la Lista Roja de la UICN: Versión 3.1. Comisión de Supervivencia de Especies de la UICN. UICN, Gland, Suiza y Cambridge, Reino Unido.

Weigend, M. 2002. Observations on the biogeography of the Amotape-Huancabamba zone in northern Peru. Bot. Rev. 68(1): 38–54.

Meliosma stellata, una Nueva Especie de Sabiaceae de Ecuador

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Resumen. Se describe e ilustra *Meliosma stellata* Cornejo & Bonifaz, una nueva especie de Sabiaceae del bosque montano andino al suroccidente de Ecuador. Esta es parecida a *M. violacea* Cuatrecasas & Idrobo de Colombia, pero difiere por tener frutos más pequeños ca. 1.5 cm (vs. 2.6 cm) de largo, sin la característica tinta violeta, y principalmente por poseer unos muy distintivos tricomas escleróticos estrellados de 4 brazos. Estos últimos son un importante caracter que previamente no estaba documentado para las especies de este género.

Abstract. *Meliosma stellata* Cornejo & Bonifaz, a new species of Sabiaceae from the Andean montane forests of southwestern Ecuador, is described and illustrated. The new species resembles the Colombian species *M. violacea* Cuatrecasas & Idrobo but differs by having smaller fruits, ca. 1.5 cm (vs. 2.6 cm) long, without its characteristic purple sap, and mainly by having highly distinctive sclerotic 4-branched stellate trichomes. This last feature is a significant character previously not recorded for species within this genus.

Key words: Ecuador, endemic, 4-branched trichomes, *Meliosma*, Sabiaceae.

Meliosma Blume (Sabiaceae) es un género de árboles y arbustos nativos de Asia y América tropical. En el Neotrópico comprende ca. 50 especies, y se encuentra distribuido desde México hasta Brasil y Bolivia y las Indias Occidentales (Gentry, 2001; Arbeláez, 2004). En América del Sur *Meliosma* se encuentra concentrado al norte de los Andes, y su conocimiento taxonómico es aún incompleto (Gentry, 1980, 1986, 1992, 2001). En Ecuador 13 especies ocurren en los bosques húmedos y muy húmedos, tropicales hasta montanos (en el *Catálogo de las Plantas Vasculares* se citan *M. littlei* Cuatrecasas y *M. panamensis* Standley como especies válidas, pero éstas son sinónimos de *M. glabrata* (Liebmann) Urban (Gentry, 1980, obs. pers.)) y se estima que hay al menos otras cinco especies no descritas (Liesner, 1999). Durante la revisión de Sabiaceae para *Flora de Ecuador* (Cornejo, en prep.), ha sido encontrada la siguiente novedad.

Meliosma stellata Cornejo & Bonifaz, sp. nov. TIPO: Ecuador. El Oro: Huertas, en quebrada con vertientes, 1270 m, 8 Feb. 1998 (fr), *X. Cornejo & C. Bonifaz 5955* (holotipo, GUAY; isotipos, AAU, MO, QCA, QCNE). Figura 1.

Arbor vel frutex usque ad 4 m altus; ramulis lenticellatis. Folia petiolo 1.8–5.0 cm longo, strigoso; lamina oblongo-obovata vel oblanceolata, 23–50 × 7.5–14 cm, acute serrata, base anguste cuneata, apice plerumque acuminata. Flores non visi. Infructescentia axillaris, paniculata, strigosa, 10–13 cm longa, manifeste lenticellata. Fructus asymmetrice pyriformis, ca. 1.5 × 1.1 cm, trichomatibus stellatis sparse dispersis ornatus ut videtur glaber.

Arbolillo o arbusto 4 m alto, muy ramificado; brotes densamente estrigosos; ramas terminales lenticeladas, glabrescentes. Hojas espiraladas, agrupadas hacia las porciones terminales de las ramas; peciolo 1.8–5 cm de largo, denso- a laxo-estrigoso; lámina oblongo-obovada u oblanceolada, papirácea, 23–50 (ó más) × 7.5–14 cm, ápice usualmente acuminado, base angosto cuneada, margen laxo-serrado con dientes papiráceos muy agudos y pequeños, ca. 1–2 mm de largo; la haz café-obscura (en seco) con nervio medio y secundarios impresos a sulcados, nervio medio estrigoso-tomentoso, los secundarios tomentulosos- hasta laxo-estrigosos, glabra en el el resto de la lámina; el envés con nervios primarios y secundarios prominentes, laxo-estrigoso; 20 a 31 pares de nervios secundarios. Inflorescencias y flores desconocidas; sépalos 5, persistentes en fruto, deltoides, ca. 1 mm de largo, glabros, con margen ciliado. Infructescencia una panícula axilar, 10–13 cm de largo, ± laxo-estrigosa; ráquis y ramas con abundantes y promi-

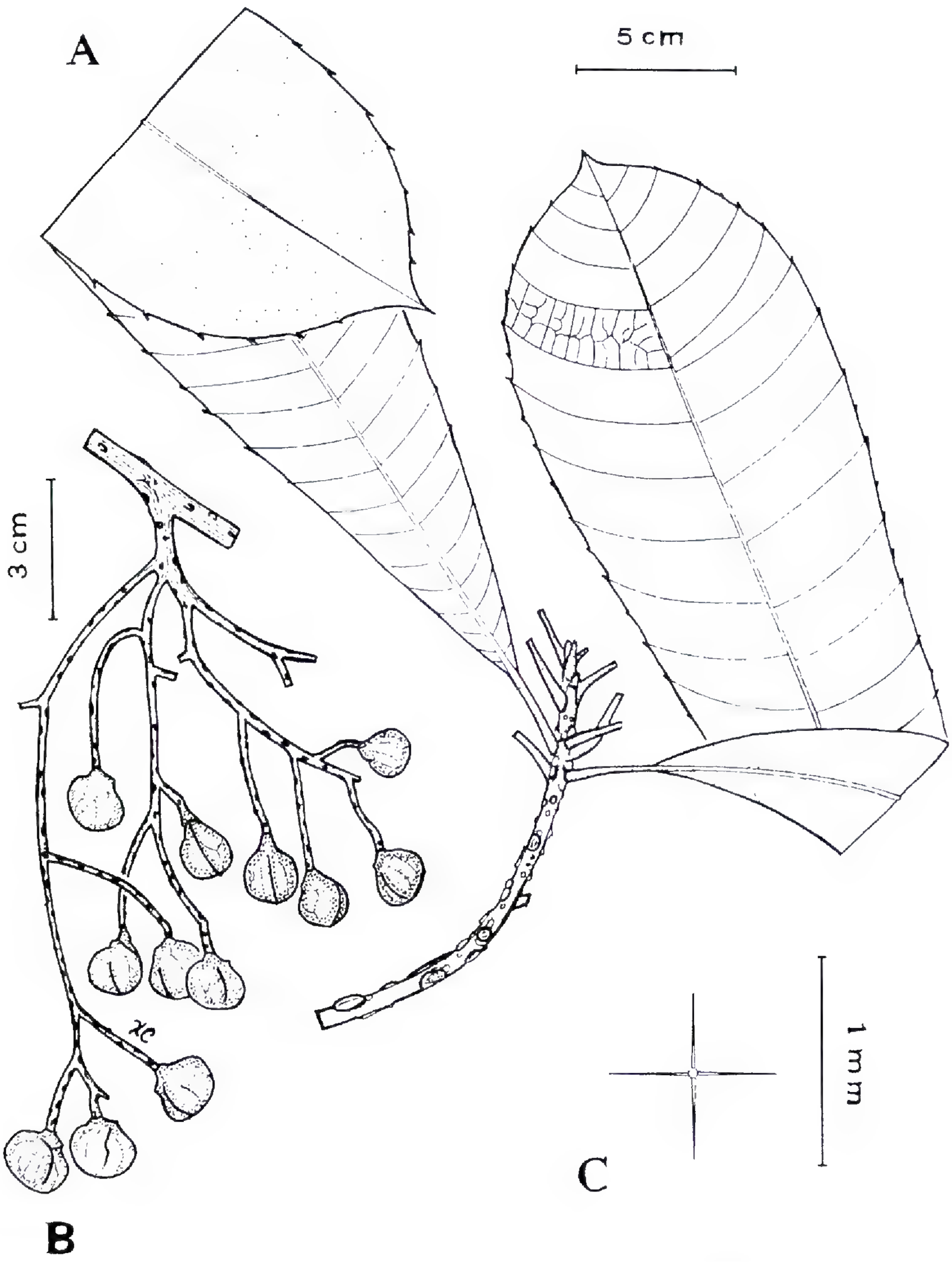

Figura 1. *Meliosma stellata* Cornejo & Bonifaz. —A. Rama terminal. —B. Infructescencia. —C. Detalle de un tricoma esclerótico estrellado de 4 brazos, visto desde arriba. (A–C *Cornejo & Bonifaz 5955*, holotipo, GUAY.)

nentes lenticelas suborbiculares hasta angosto-elípticas, 1–3.5 mm de largo, cubiertas por un tejido suberoso; pedicelos leñosos, cortos y gruesos. Frutos subsésiles, asimétricos, ampliamente piriformes, ca. 1.5 × 1.1 cm, fuertemente quillados y un poco nervados al secar, aparentemente glabros, con escasos, rígidos y frágiles tricomas escleróticos estrellados de 4 brazos horizontales dispuestos sobre los pedicelos y frutos, ca. 0.7–0.8 mm de ancho; 1 semilla.

Etimología. El epíteto *stellata* se refiere a sus característicos tricomas escleróticos estrellados dispuestos sobre los pedicelos y frutos.

Distribución y ecología. Conocida solamente de la localidad del tipo, un pequeño remanente de bosque muy húmedo montano disturbado, localizado en el flanco suroccidental de los Andes de Ecuador.

Por sus grandes hojas de láminas papiráceas, oblongo-obovadas u oblanceoladas (Fig. 1A), *Meliosma stellata* vegetativamente es parecida a *M. violacea* Cuatrecasas & Idrobo, de Colombia, pero difiere de esta última especie por tener frutos más pequeños ca. 1.5 cm (vs. 2.6 cm), nervados (en seco), quillados, sin la característica tinta violeta y con escasos pero distintivos tricomas escleróticos estrellados de 4 brazos (Fig. 1C), los cuales también están presentes en los pedicelos. Éstos tricomas estrellados constituyen un nuevo y distintivo caracter que no estaba documentado en ninguna de las especies de *Meliosma*. Éstos se rompen muy fácilmente durante la

colección en campo y el manipuleo del material vegetal en el proceso de herborización, por lo que los frutos de los especímenes de *M. stellata* en herbario aparentan ser glabros.

Agradecimientos. *Meliosma stellata* fue colectada durante la fase de campo del Proyecto: Inventario de los atractivos turísticos de la Prov. El Oro (CETUR), realizado en 1998. Los autores tuvimos el placer de visitor los herbarios: AAU, K, LOJA, MO, NY, QCA, QCNE, WIS. Un especial agradecimiento a Alba Arbeláez, Victoria Hollowell (MO) y a un tercer revisor anónimo por sus constructivos comentarios sobre el manuscrito. Roy Gereau gentilmente perfeccionó la diagnosis en latín.

Literatura Citada

Arbeláez, A. L. 2004. Two new species of *Meliosma* (Sabiaceae) from Bolivia. Novon 14: 12–16.

Gentry, A. H. 1980. Part VI. Family 109. Sabiaceae. *In* R. E. Woodson Jr. & R. W. Schery (editors), Flora of Panama. Ann. Missouri Bot. Gard. 67: 949–963.

———. 1986. New Neotropical species of *Meliosma* (Sabiaceae). Ann. Missouri Bot. Gard. 73: 820–824.

———. 1992. Four new species of *Meliosma* (Sabiaceae) from Peru. Novon 2: 155–158.

———. 2001. Sabiaceae. Pp. 2303–2306 *in* W. D. Stevens, C. Ulloa Ulloa, A. Pool & O. M. Montiel (editors), Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Gard., Vol. 85, III.

Liesner, R. L. 1999. Sabiaceae. Pp. 881–882 *in* P. M. Jørgensen & S. León-Yánez (editors), Catalogue of the Vascular Plants of Ecuador. Monogr. Syst. Bot. Missouri Bot. Gard., Vol. 75.

A New Combination for *Thrasya robusta* in *Paspalum* (Poaceae, Paniceae)

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Abstract. The new combination *Paspalum robustum* (Hitchcock & Chase) S. Denham replaces the illegitimate name *Paspalum calliferum* S. Denham, species from the Caribbean and northern South America.

Resumen. La nueva combinación *Paspalum robustum* (Hitchcock & Chase) S. Denham reemplaza al nombre ilegítimo *Paspalum calliferum* S. Denham, especie del Caribe y norte de Sud América.

Key words: Neotropics, Paniceae, *Paspalum*, Poaceae, subgenus *Harpostachys*.

The name *Paspalum robustum* Link ex Steudel (1841: 273) was placed by Steudel in synonymy of *P. elegans* Flüggé (1810) and therefore is an invalidly published name (cf. Articles 32.1 and 34.1, Greuter et al., 2000). Later, *P. calliferum* S. Denham (2005: 501) was erroneously published as a replacement name when *Thrasya robusta* Hitchcock & Chase was transferred to the genus *Paspalum* L. Thus, the name *Paspalum calliferum* is superfluous and illegitimate (cf. Art. 52.1, Greuter et al., 2000). The epithet *robustum* is available for use within *Paspalum*, and herein this oversight is emended.

Paspalum robustum (Hitchcock & Chase) S. Denham, comb. nov. Basionym: *Thrasya robusta* Hitchcock & Chase, Contr. U.S. Natl. Herb. 18(7): 297. 1917. TYPE: West Indies. Trinidad: St. Joseph, 23 Dec. 1912, *A. S. Hitchcock 10187* (holotype, US 865559; isotype, K).

Paspalum robustum belongs to subgenus *Harpostachys* (Trinius) S. Denham of *Paspalum* and was treated from Costa Rica, Panama, Colombia, Venezuela, French Guiana, Suriname, and Trinidad and Tobago by Denham (2005). This species is distinguished by its foliaceous rachises of the racemes 8–30 cm long, spikelets with a basal callus, and upper glume with delicate hairs uniformly distributed on its surface.

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Literature Cited

Denham, S. S. 2005. Revisión sistemática del subgénero *Harpostachys* de *Paspalum* (Poaceae: Panicoideae: Paniceae). Ann. Missouri Bot. Gard. 92: 463–532.

Flüggé, J. 1810. Graminum Monographiae ... Pars I. *Paspalum*. *Reimaria*. F. Perthes et J. H. Besser, Hamburg.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Steudel, E. T. 1841. Nomenclator Botanicus, ed 2. 2: 1–810.

Thoreauea guerrerensis (Apocynaceae, Apocynoideae), una Nueva Especie de Guerrero, México

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Resumen. Se propone una nueva especie de *Thoreauea* J. K. Williams. Esta especie difiere de *Thoreauea paneroi* J. K. Williams por tener una corona corolina 10-lobulada en el ápice y estambres tan largos como la corona. La especie que aquí se describe tiene como hábitat los bosques de *Pinus* L., *Quercus* L., *Abies* Miller y bosque mesófilo de montaña que se localizan en la parte más alta de la Sierra de Guerrero. Se describen por primera vez los frutos y las semillas para el género.

Abstract. A new species of *Thoreauea* J. K. Williams is proposed. This species differs from *Thoreauea paneroi* J. K. Williams in its corolline crown 10-lobulate at the apex and stamens as long as the crown. The species described in this paper was found in habitats of forests of *Pinus* L., *Quercus* L., and *Abies* Miller and in montane rain forest found in the highest region of the Sierra of Guerrero. The fruits and seeds are described for the first time for this genus.

Key words: Apocynaceae, Apocynoideae, Guerrero, Mexico, *Thoreauea*.

El estudio de las Apocynaceae (Apocynoideae) en la Sierra de Guerrero a lo largo de varios años permitió reunir una colección de especímenes cuyas características corresponden al género *Thoreauea* J. K. Williams, recientemente descrito por Williams (2002a), con una sola especie *Thoreauea paneroi* J. K. Williams. Para determinar si el material de Guerrero correspondía a esta especie fue visitada la localidad tipo del género para colectar especímenes vivos de dicha especie. Las flores de estos especímenes se caracterizan por presentar en la garganta una corona corolina profundamente 5-lobulada y el ápice de las anteras apenas alcanza la base de la corona, o sea de la garganta; en cambio las flores de los especímenes de Guerrero poseen una corona corolina ligeramente 10-lobulada y las anteras alcanzan el ápice de la corona. Estas características son constantes en todos los especímenes examinados, por lo que se piensa que corresponden a una especie no descrita. Los folículos unidos, que aquí se describen por primera vez para el género, confirman su relacionan con *Thenardia* HBK, tal como lo había expresado Williams (2002a).

Thoreauea guerrerensis N. Diego & Lozada-Pérez, sp. nov. TIPO: México. Guerrero: Mun. General Heliodoro Castillo, km 10, camino de Puerto El Jilguero a Puerto del Gallo, 27 Abr. 1983, *F. G. Lorea 2401* (holotipo, FCME; isotipos, HEB, MEXU, MO, XAL). Figura 1.

Haec species *Thoreaueae paneroi* affinis, sed corona corollina vix 10-lobata apice et staminibus coronam aequantibus differt.

Lianas con látex acuoso; tallos cilíndricos de 3–3.5 mm diám., glabros. Hojas opuestas a subopuestas, pecioladas; láminas 10–11 × 2.5–4.5 cm, elípticas a oblongas, ápice acuminado, margen entero, base obtusa, venación pinnada, con 7 a 15 pares de venas secundarias laterales, haz verde oscuro, lustrosa, glabra, sin coléteres en la base de la lámina, envés verde pálido, glabro; pecíolos 2–2.6 cm de largo, con tricomas multicelulares en su lado adaxial; con 2 coléteres en la base, 0.8–1.3 mm de largo, lanceolados y café oscuro cuando secos, fusionados intrapeciolarmente y unidos a un reborde interpeciolar para formar un anillo alrededor del nudo. Flores 25 a 30, dispuestas en una cima subumbelada, tricótoma, axilar, 3.5–1.5 cm de largo, más corta que las hojas; pedúnculos 1.5–3.5 cm de largo, glabros; brácteas 1–2 × 0.5 mm, oblongas a estrechamente oblongas, con 2 coléteres laterales en la base, glabras; pedicelos 0.9–1 cm de largo, glabros. Lóbulos del cáliz divididos casi hasta la base, subiguales, 1–1.5 × 1 1.2 mm, triangulares, erectos, glabros, con un coléter opuesto a cada lóbulo en su lado adaxial, 0.5–0.7 mm de largo, ovado, ápice truncado y denticulado. Corola pentámera, raramente tetrámera, blanca, urceolada; tubo 3.5–4.5 mm de largo, ca 3.5 mm de ancho en la base, base ensanchada, glabra, lóbulos subiguales, 2.5 3.5 × 2.5–3 mm, ovados a ampliamente ovados, ápice obtuso, redondeado a truncado, ciliolado, márgenes ligeramente asimétricos, garganta con una corona anular carnosa, 1.3–1.5 mm de largo, 10-lobulada en el ápice, los lóbulos 0.3–0.4 × 0.5–0.7 mm, ápice redondeado a truncado. Estambres 5, raramente 4, 4.5–5 mm de largo, tan largo como la corona; filamentos ca. 3 mm de largo, unidos cerca de la base de la corola, flexionados hacia

Figura 1. *Thoreauea guerrerensis* N. Diego & Lozada-Pérez. —a. Rama con hojas e inflorescencia. —b. Vista externa de la corola. —c. Corola con la corona en la garganta. —d. Flor con la corola removida. —e. Flor con la corola parcialmente removida y un nectario eliminado. —f. Corola abierta con la corona y los estambres expuestos. —g. Anteras parcialmente removidas con la cabeza estilar expuesta. —h. Lóbulos del cáliz con los coléteres y el ovario rodeado por 5 nectarios. —i. Pecíolos con coléteres unidos en la axila. —j. Rama con frutos. —k. Fruto parcialmente abierto. —l. Semilla. Drawn from *Diego & M. Castro 9247* (FCME).

adentro, formando un tubo alrededor del estilo y engrosados en el ápice, blanco pubescentes lateral y ventralmente, el dorso glabro; anteras amarillas, 2.7–3 mm de largo, base sagitada con los lóbulos flexionados hacia fuera; pistilo 3.5–4 mm de largo; ovario súpero, formado por 2 carpelos fusionados, 0.8–1 mm de largo, ovoide, glabro, rodeado por 5 nectarios erectos, ca. 0.8–1 mm de largo, tan largos o escasamente más cortos que el ovario, unidos en la base ca. 0.5 mm; estilo 2.8–3 mm de largo, glabro; cabeza estilar 0.7–1 mm de largo, elipsoide (material fresco), ápice bilobado, aglutinado a las anteras, con un collar membranáceo en la base, aglutinado al ápice de los filamentos. Folículos 2, fusionados, 12–16 × 0.5–0.7 cm, angostamente aplanado elipsoides, glabros, dehiscentes longitudinalmente. Semillas pardas, 1.5–1.7 cm de largo, lado proximal cóncavo, el distal convexo y a veces aquillado engrosado, margen alado y entero, lado distal verrucoso hacia el centro, coma blanco amarillento, 3–4 cm de largo.

Distribución y fenología. *Thoreauea guerrerensis* se conoce de la Sierra de Guerrero, México en los límites de los municipios de Atoyac de Alvarez y General Heliodoro Castillo. Tiene como hábitat los lugares sombreados del bosque de *Pinus* L., *Quercus* L. y *Abies* Miller y el bosque mesófilo de montaña que se encuentran entre 2400 y 2650 m de altitud. También han sido recolectados especímenes estériles a 1800 m de altitud. Florece de abril a octubre y fructifica de junio a diciembre.

Epíteto específico. El epíteto específico honra al estado de Guerrero, donde se han recolectado todos los especímenes citados.

Thoreauea guerrerensis comparte con *T. paneroi* la mayoría de los caracteres vegetativos, particularmente aquellos relacionados con el tallo y las hojas. Williams (2002a) describe para *T. paneroi* la presencia de látex lechoso, sin embargo en especímenes colectados por nosotros en abril de 2006 en la misma localidad tipo de esa especie encontramos la presencia de látex acuoso, misma condición que presenta la especie que aquí se describe; carácter que no es mencionado en la redescripción que del género realiza Morales (2005), o de *T. aberrans* J. F. Morales, que él mismo describe. En *T. paneroi* se menciona la presencia de coléteres y una bráctea relacionados al pecíolo, sin embargo, nuestras observaciones establecieron que los coletéres forman un continuo intrapeciolar, que tal vez correspondería a lo que Williams (2002a) describe como brácteas. Tales caracteres también fueron observados en un espécimen (*J. I. Calzada 19725*, depositado en MEXU, no revisado por Williams) colectado cerca de la localidad tipo de *T. paneroi*, por lo que suponemos que ambas especies comparten dicho carácter. En ambas especies los pecíolos son pubescentes adaxialmente. Los caracteres vegetativos de la inflorescencia también son muy similares. Las diferencias fundamentales entre ambas especies se encuentran en los caracteres florales. En *T. guerrerensis* el tubo de la corola es de 3.5–4.5 mm de largo y en *T. paneroi* es de 5–6 mm de largo. En *T. guerrerensis* la corona es ligeramente 10-lobulada en el ápice, cada lóbulo de 0.3–0.4 mm de largo, a diferencia de *T. paneroi* que presenta una corona profundamente 5-lobulada, con los lóbulos de 1.4–1.6 mm de largo; la existencia de 5 lóbulos fue diagnosticado posteriormente por Morales (2005) al examinar flores de la colección tipo y confirmado por nosotros en especímenes recolectados en la localidad tipo de dicha especie. En *T. guerrerensis* los filamentos son ligeramente más largos y son del mismo grosor en toda su longitud, no así en *T. paneroi* que posee filamentos más cortos y gradualmente engrosados hacia la base. En ambas especies los filamentos son pubescentes adaxialmente y glabros abaxialmente, pero en *T. guerrerensis* el indumento es de color blanco y menos denso y en *T. paneroi* el indumento es pardo y más denso. En la descripción original de *T. paneroi* se había considerado que los nectarios que rodean al ovario se encontraban libres, sin embargo en el material recolectado por nosotros en la localidad tipo los nectarios se encuentran unidos, por lo que suponemos que tal carácter es compartido por ambas especies, sin embargo una conclusión definitiva al respecto se alcanzara cuando sean recolectados más especímenes, ya que existe el ejemplo de *Echites turrigera* Woodson, especie que puede tener nectarios libres o unidos (Williams, 2002b). Finalmente en ambas especies el ápice de la cabeza estilar es bilobado, carácter que no ha sido descrito para el género (Williams, 2002a; Morales, 2005).

Por lo que respecta a *Thoreauea aberrans*, esta especie es fácilmente contrastable con *T. guerrerensis* ya que presenta una corola campanulada, con el tubo de 2.5–3 mm de largo y una corona anular inconspicuamente lobulada.

Paratipos. MEXICO. **Guerrero:** Mun. Heliodoro Castillo, Cañada de Las Margaritas, *V. Diego, E. Acosta & G. Fernández 8781* (FCME, IEB, MEXU); Cañada de Las Margaritas, *V. Diego, M. Castro & G. Fernández 9037* (FCME, IEB, MEXU); Cañada de Las Margaritas, *V. Diego & M. Castro 9217* (FCME, IEB, MEXU); Cañada de Las Margaritas, *V. Diego & R. de Santiago 9320* (FCME, IEB, MEXU); Entre el Jilguero y Las Margaritas, *E. León, L. Lozada & J. Rojas 223* (FCME, IEB, MEXU).

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Literatura Citada

Morales, J. F. 2005. Estudios en las Apocynaceae Neotropicales XV: Sinopsis del género *Thoreauea* (Apocynoideae, Echiteae), con una nueva especie de Veracruz, México. Brittonia 57(3): 258–263.

Williams, J. K. 2002a. *Thoreauea* (Apocynaceae: Apocynoideae), a new genus from Oaxaca, Mexico. Lundellia 5: 47–58.

———. 2002b. A further evaluation of *Echites* sect. *Yucatanense* (Apocynaceae) with additional notes on the genus. Brittonia 54(4): 310–317.

Three New Mesoamerican Taxa of *Dichaea* with Caducous Leaves

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Abstract. Two new species and one subspecies of Mesoamerican *Dichaea* Lindley with caducous leaves are described and illustrated. *Dichaea dressleri* Folsom, a new species with narrow, glaucous leaves and resembling *D. gracillima* C. Schweinfurth, is described from wet forests in western Panama. *Dichaea globosa* Dressler & Pupulin, a new species described from Costa Rica and Panama, is a close ally of *D. fragrantissima* Folsom and of the widespread *D. morrisii* Fawcett & Rendle and may be distinguished by the fleshy, subtruncate lip with a broad claw and obovate petals. *Dichaea fragrantissima*, already described from Panama with a short diagnosis, is more fully described here. It is distinguished by the short, obtuse, lateral lobes of the lip, the subquadrate ligule and the narrow, subacuminate sepals and petals. Within *D. fragrantissima*, subsp. *fragrantissima* has prominent lilac lines on the sepals and petals and the lip is lilac, while subsp. *eburnea* Dressler & Pupulin, of Nicaragua, Costa Rica, and Panama, is distinguished by ivory flowers with greenish ivory apices and smaller lateral lobes of the lip. Some members of subsp. *eburnea* are autogamous. *Dichaea morrisii*, although ranging widely in South America, is uncommon in Mesoamerica.

Resumen. Se describen y se ilustran dos nuevas especies y una nueva subespecie de *Dichaea* Lindley de hojas caúducas de Mesoamérica. *Dichaea dressleri* Folsom, una especie con hojas estrechas y glaucas, parecida a *D. gracillima* C. Schweinfurth, se describe de bosques húmedos de Panamá occidental. *Dichaea globosa* Dressler & Pupulin, conocida de Costa Rica y Panamá, es pariente cercano de *D. fragrantissima* y de *D. morrisii* Fawcett & Rendle, de distribución amplia, y se puede distinguir por el labelo carnoso, subtruncado, con la uña ancha, y los pétalos obovados. *Dichaea fragrantissima*, ya descrita de Panamá, se distingue por los lóbulos laterales del labelo cortos, la lígula subcuadrada y los sépalos y pétalos estrechos y subacuminados. Se provee una descripción más amplia que la de la publicación original. Dentro de *D. fragrantissima*, la subsp. *fragrantissima* tiene rayas lilas en los sepalos y pétalos y el labelo lila, y los lóbulos laterales del labelo más largos, mientras la subsp. *eburnea* Dressler & Pupulin se distingue por las flores color marfil con los ápices marfil verdosos y los lóbulos laterales del labelo cortos y obtusos. Algunas de las plantas de subsp. *eburnea* son autógamas. *Dichaea morrisii* tiene una distribución amplia en Sudamérica, pero es poco común en Mesoamérica

Key words: *Dichaea*, Mesoamerica, Orchidaceae.

With the description of several new species of *Dichaea* section *Dichaea* (Orchidaceae) by Folsom (1994b), that group, with persistent leaves, is now relatively well understood in Central America, although there are a few very tiny, probably unnamed, creeping plants of which more and better specimens are needed. There remain more problems in the species with caducous leaves, including their correct sectional classification. The greatest confusion involves *D. morrisii* Fawcett & Rendle and its close allies, treated below. *Dichaea dressleri* Folsom, with alphabetic priority, is only distantly related to the *D. morrisii* complex.

1. **Dichaea dressleri** Folsom, sp. nov. TYPE: Panama. Chiriquí: forest near Fortuna Lake, just beyond bridge, 1100 m, 9 Apr. 1985, *J. P.*

Folsom 11278A (holotype, PMA; isotypes, HNT, MO). Figure 1.

Dichaeae gracillimae similis, sed foliis brevioribus, floribus majoribus, labello acuminato, lobulis lateralibus expansis.

Epiphytic, caespitose, erect or arching, roots 1–1.5 mm diam.; stems 8–30 cm long. Leaves distichous, sheathing, bases appressed to stem, blades 1.9–4 × 0.1–0.3 cm, linear, acute. Inflorescence axillary, 1-flowered, peduncle 15–20 mm long; floral bract 2–3 × 2–3 mm, infundibuliform, apiculate; sepals and petals pale green, lip white or cream, spotted with red-violet; sepals 10–11 × 1.5–2 mm, lanceolate, acuminate; petals 9.5–10 × 1.8–2 mm, narrowly lanceolate; lip 6.5 × 5–5.5 mm, base ca. 3 × 3 mm, short-unguiculate, subquadrate with rounded corners, blade hastate-triangular with recurved, spreading lateral lobules, acuminate; column 2 mm long; ovary 1.3 mm long, glabrous.

In its glaucous foliage, *Dichaea dressleri* resembles the common and widespread *D. panamensis* Lindley. In its long, narrow leaves, this new species is reminiscent of *D. gracillima* C. Schweinfurth, known only from its type collection in Costa Rica. While the flowers of the holotype of *D. gracillima* (AMES) are all immature, there is a better flower with the isotype at NY. The leaves of *D. gracillima* are even longer (to 4.8 cm) than those of *D. dressleri*, and the lip is long-unguiculate, with the lateral lobes short and retrorse and the apex apiculate. The lip of *D. dressleri*, however, has spreading, slightly recurved lateral lobes and the apex is acuminate. Until *D. gracillima* is collected again, we cannot know whether or not the plant is glaucous.

Distribution, habitat, and phenology. Western Panama at 900–1200 m elevation; flowering March to October.

Paratypes. PANAMA. **Chiriquí:** Fortuna Valley, *R. L. Dressler 5331* (FLAS, MO, PMA); *B. Hammel 2067* (MO); *B. Hammel 2294* (MO). **Veraguas:** Proyecto Arizona (Buenos Aires), N slope of ridge E of Cerro Arizona, *R. L. Dressler 5194* (MO).

Dichaea morrisii is here used in its traditional sense. Nir (2000) has used *D. muricata* (Swartz) Lindley as the correct name for *D. morrisii*, and Swartz specimens at the Reichenbach Herbarium (W) indicate that this was Swartz's usage (Dressler, 2005). However, while this change may cause only a little confusion in the West Indies, on the mainland *D. muricata* has been applied to the most common medium-sized member of subgenus *Dichaea* in each area. The name *D. muricata* clearly has been "persistently used for ... taxa not including its type," and should be proposed for rejection (Art. 56; Greuter et al., 2000). A proposal to reject *Cymbidium muricatum* Swartz appeared in *Taxon* (Dressler & Folsom, 2005).

It became clear some years ago that there were more than one *Dichaea* species with large plants and wide leaves in Mesoamerica, and we at first erred in thinking that there were only two species, one of which would be *D. morrisii*. In fact, *D. morrisii* is the least frequent of three distinct species in the area and is somewhat intermediate between the other two species in some features.

Key to the *Dichaea morrisii* Complex in Central America

1a. Lateral lobes of lip less than 2.5 mm long, from obtuse angled to oblong; ligule of column subquadrate, truncate or bifid; sepals and petals sublanceolate, narrowly acute and widest basally; flowers ivory with or without lilac lines . . . . . *D. fragrantissima*
  2a. Sepals and petals each with 7 to 9 lilac lines; blade of lip lilac; lateral lobes of lip 1–2.4 mm long . . . . *D. fragrantissima* subsp. *fragrantissima*
  2b. Flowers ivory, with greenish ivory apices; lateral lobes from rounded angles to ca. 1.2 mm long . . . *D. fragrantissima* subsp. *eburnea*
1b. Lateral lobes 2.5–6 mm long, reflexed, acuminate (blade thus distinctly sagitate); ligule triangular; petals ovate to obovate; flowers green marked with red-purple
  3a. Petals oblong-ovate, widest near middle, acute; claw of lip ligulate, 1–3 mm wide distally (in Central America), with a distinct callus at base; ligule of column porrect; sepals and petals marked with lines basally . . . . . *D. morrisii* (syn. *D. bradeorum* Schlechter)
  3b. Petals distinctly obovate, widest above middle, apiculate; claw of lip broadly obovate, 6–8 mm wide at base of blade, without basal callus; blade thick, more or less truncate; ligule of column deflexed; sepals and petals usually blotched . . . . . *D. globosa*

2a. Dichaea fragrantissima Folsom, Orchid Digest 58: 99. 1994. TYPE: Panama. Coclé, Alto del Calvario, cont. divide, N of El Copé, 850–950 m, flowered in cult., 6 Apr. 1985, *J. P. Folsom 11283 NY* (holotype, PMA; isotype, MO). Figure 2.

Although the species was validly published (Folsom, 1994a), a complete description of this species was not provided, and so one is offered here: Epiphytic, caespitose, roots 1–1.5 m diam.; stems to 30 cm long, 17–21 mm wide across conduplicate sheaths. Leaf blades 4.5–6.5 × 0.7–1.4 cm, oblong, obtuse, retuse or apiculate; flowers axillary, peduncles 15–20 mm long; floral bracts 11–14 × 8–14 mm, ovate-orbicular, acuminate, secondary bract lanceolate, ca. 11 × 2 mm; sepals and petals white or ivory with 7 to 9 lilac stripes, midlobe of lip lilac; sepals and petals ovate-lanceolate, narrowly acute-acumi-

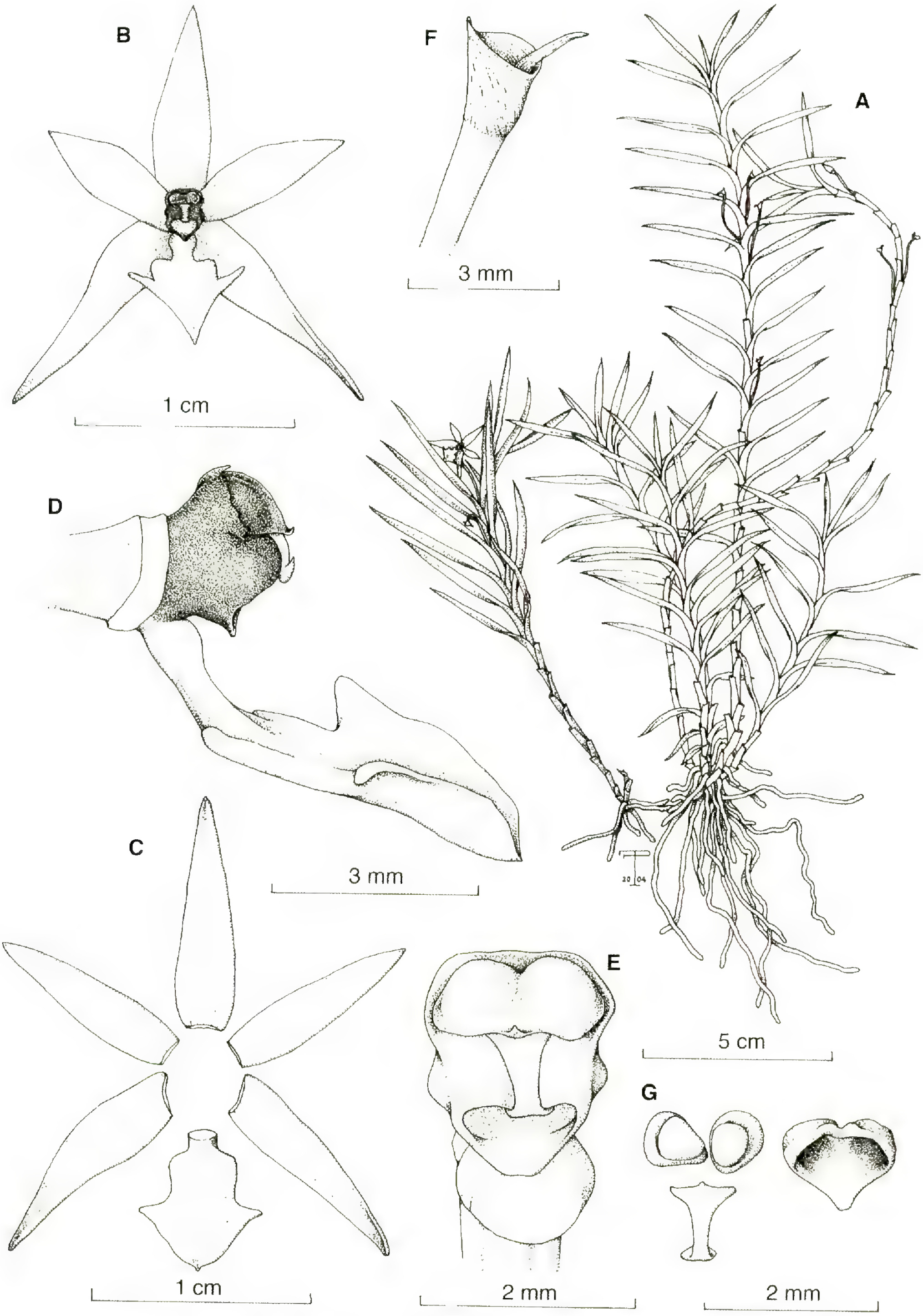


Figure 1. *Dichaea dressleri* Folsom. —A. Habit. —B. Flower. —C. Dissected perianth. —D. Column and lip, lateral view. —E. Column, ventral view. —F. Apex of inflorescence. —G. Pollinarium (the caudicles removed) and anther. Drawn from *Folsom 112784* (MO).

nate, margins hispid-ciliate; dorsal sepal 12–14 × 6 mm, lateral sepals 13–15 × 6–7 mm, petals 11–14 × 4 mm; lip 10–12 × 5–7 mm, claw 5.5–6 × 3.5–4 mm, dorsally keeled, midlobe 5 × 6 mm, lateral lobes 1–2.4 mm long; column 3.5–4 mm long, with distinct foot, with a rounded callus between column foot and lip, ligule 1.5–2 × 1.5–2 mm, subquadrate, shallowly emarginate; ovary 2–3 mm long, muricate.

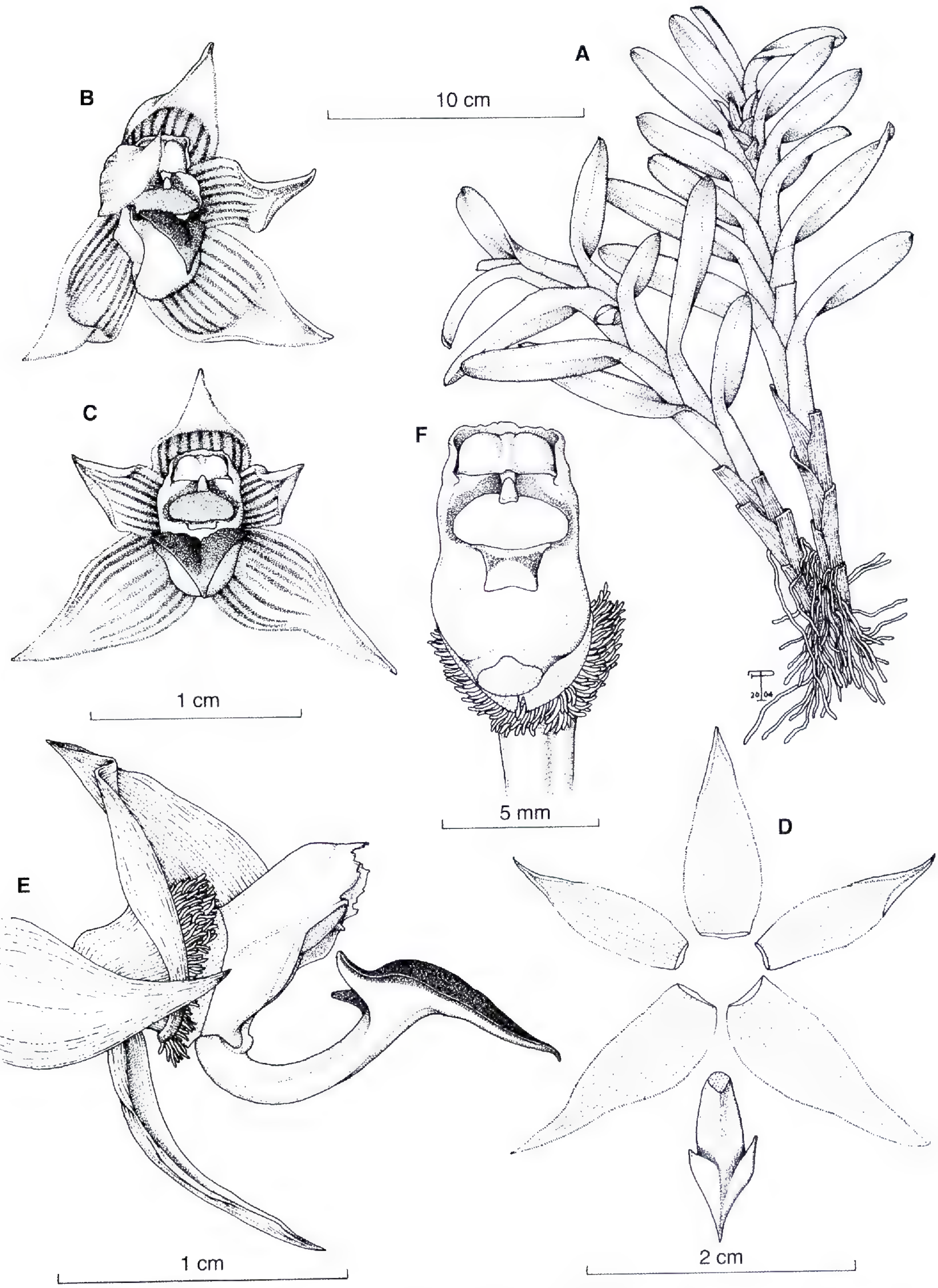


Figure 2. *Dichaea fragrantissima* subsp. *fragrantissima*. —A. Habit. —B. Flower, three quarters view. —C. Flower, frontal view. —D. Dissected perianth. —E. Column and lip, lateral view. —F. Column, ventral view. A, C–F, drawn from *Maduro & Olmos 189* (MO); B drawn from *Folsom 11283 NN* (photo of type).

Dichaea fragrantissima is readily distinguished from *D. morrisii* by the short, obtuse, lateral lobes of the ecallose lip, by the subquadrate ligule, and by the long, narrow, subacuminate sepals and petals. The subspecies *fragrantissima* is known only from cloud forests in Coclé and Veraguas provinces in Panama and has been collected only a few times. It differs from the new subspecies *eburnea* (described below) primarily in flower coloration and in having somewhat larger lateral lobes, or retrorse angles, on the lip. The specimens of subspecies *fragrantissima* we have seen have a prominent callus between the column foot and the claw of the lip, and the claw of the lip has a distinct median keel. Both of these features are variable within Panamanian collections of subsp. *eburnea*.

Additional specimens examined. PANAMA. **Coclé:** trail to La Mina, Hills N of El Valle de Antón, *P. H. Allen 2871* (AMES), *A. Maduro & E. Olmos 189* (MO, PMA).

2b. Dichaea fragrantissima subsp. **eburnea** Dressler & Pupulin, subsp. nov. TYPE: Costa Rica. Alajuela: San Ramón, Res. Biol. A. M. Brenes, fl. in cult. at Jard. Bot. Lankester, 13 June 2000, *M. Blanco 513* (holotype, USJ). Figure 3.

A subspecie fragrantissima floribus eburneis, apicibus sepalorum petalorumque viridibus, labelli lobulis lateralibus brevioribus obtusis recedit.

Roots 0.7–1 mm diam.; stems with leaf bases 13–19 cm wide. Leaves 3.5–7.3 × 0.6–1.6 cm. Flowers ivory, with greenish ivory apices, margins of all perianth segments hispid-ciliate; dorsal sepal 14–16 × 4–6.5 mm; lateral sepals 14–15 × 5.5–7 mm; petals 12–14 × 4–5 mm; lip 10–14 × 5–6 mm, claw ca. 5.5 × 2–4 mm, dorsally keeled or not, with or without a rounded callus at base; midlobe 5–6 × 5–6 mm, lateral lobes from rounded angles to oblong, to 1.2 mm long; sometimes with a rounded callus between column foot and lip. Capsule ca. 18 × 15 mm, oblong, globose, muricate.

This newly described subspecies is the most common large *Dichaea* in Costa Rica and Panama, especially in wet forests on the Caribbean slope. In this subspecies the flowers are ivory in color, or occasionally with short reddish streaks at the bases of the sepals and petals, the sepals with greenish apices. The subsp. *eburnea* is much more widespread than subsp. *fragrantissima*, but we suspect that subsp. *fragrantissima* is closer to the ancestral form of the species, the ivory coloring of the flowers in subspecies *eburnea* representing floral albinism and some degree of autogamy. The plants of subsp. *eburnea* commonly bear large capsules and some are clearly self-pollinated, as in *Blanco 513* (Blanco, pers. comm.), but we do not know how frequent this may be.

Etymology. The name *eburnea* (from the Latin "eburneus," ivory white) was first suggested by A. R. Endres for a plant he collected in Costa Rica around 1867 (W 18375).

Distribution, habitat, and phenology. Nicaragua (1 specimen known), Costa Rica, and western Panama at 600–1500 m elevation; flowering all year.

Paratypes. COSTA RICA. **Alajuela:** San Ramón: Res. For., *A. Carrajal 347* (MO); Res. A. M. Brenes, ca. del Río Lorencito, fl. en cult., Jard. Bot. Lankester, *M. Germani 131* (USJ); Bajo la Balsa, *A. Carrajal 479* (MO); rd. from San Ramón through Balsa, Rio Balsa at bridge, *W. D. Stevens 13802* (MO); Monteverde Res., S side Río Peñas Blancas Valley, near Refugio Alemán, *W. Morris & L. Obando 1012* (CR, MO, SEL). **Cartago:** Res. Tapantí, vertiente arriba de Quebrada Seca, *R. L. Dressler & Biología 350, Vo. 195* (USJ); Taus, *C. Todzia 3011994b* (CR). **Heredia:** Sarapiquí, along Rio San Fernando betw. Cariblanco & Colonia del Socorro, *K. Barringer, E. Christenson, B. Pérez 3672* (MO). **Puntarenas:** Monteverde Res., Peñas Blancas Valley, *J. T. Atwood 89 311* (SEL). **San José:** P. N. Braulio Carrillo, trail from hwy. to Río Hondura/Bajo La Hondura, ca. 5 km after tunnel, *S. Ingram & K. Ferrell 812* (CR); Braulio Carrillo N. P., *J. P. Folsom 11.010* (CR); without specific locality, *A. R. Endrés 161* (W). NICARAGUA. **Zelaya:** Cerro El Hormiguero, W range, elfin forest, *J. H. Pipoly 5156* (MO). PANAMA. **Chiriquí:** Camp Hornito, Fortuna dam site, *R. L. Dressler 5338* (PMA). **Veraguas:** third branch of Río Santa María to drop-off to Calovébora, 12–15 km NW of Santa Fé, *R. L. Dressler 5114* (PMA); *R. L. Dressler 4838* (MO).

3. Dichaea globosa Dressler & Pupulin, sp. nov. TYPE: Costa Rica. San José: Pérez Zeledón, El General Valley, vic. of San Isidro del General, 730 m, 3 Mar. 1966, *A. Molina R., W. C. Burger & B. Wallenta 18291* (holotype, F; isotype, CR). Figure 1.

Dichaeae morrisii similis, sepalis petalisque obtusioribus, labello ecalloso, basi latiori, apice truncato, ligula columnae deltoidea recedit.

Epiphytic, caespitose, roots 0.5–1 mm diam.; stems 10–50 cm long, 16–20 mm wide across conduplicate sheaths. Leaves 3.8–6.3 × 1–2.1 cm, elliptic-oblong, obtuse, apiculate; peduncle 10–15 mm long; sheathing bract ca. 10 × 8 mm, infundibuliform, acuminate; floral bract 9–10 × 6–8 mm, broadly ovate, acuminate, secondary bract lanceolate, ca. 9 × 2 mm; flowers green, sepals and petals with purple spots, lip dark purple or pinkish purple; dorsal sepal 11.5–15 × 5–10 mm, broadly ovate, acute; lateral sepals 12–11 × 6–9 mm, broadly ovate, acute or apiculate; petals 10–12 × 5–7 mm, obovate, apiculate; lip 10–13 × 10–12 mm, claw 7–8 × 5–8 mm, broadly obovate, midlobe 2–4 × 12 mm, subtrun-

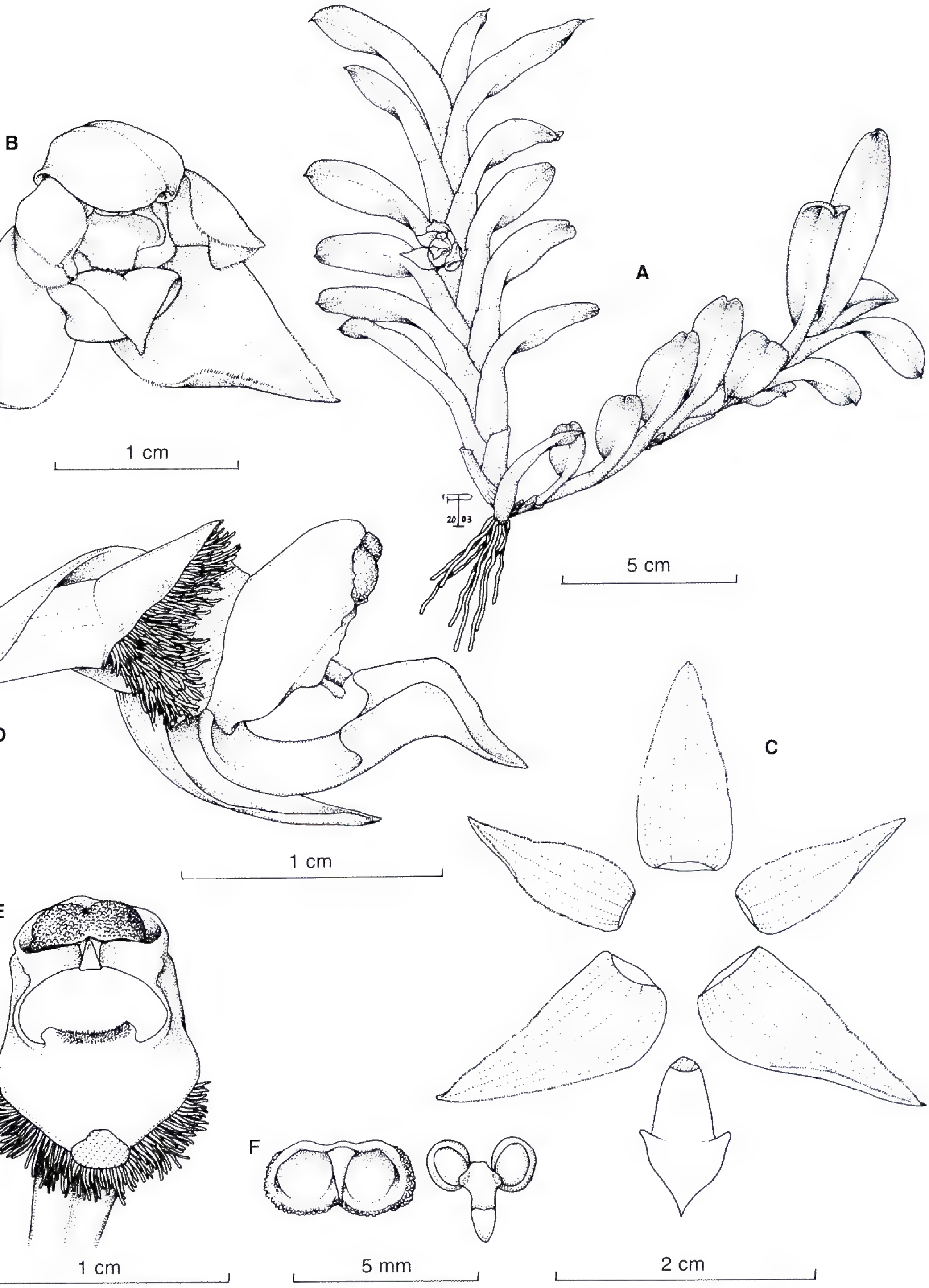
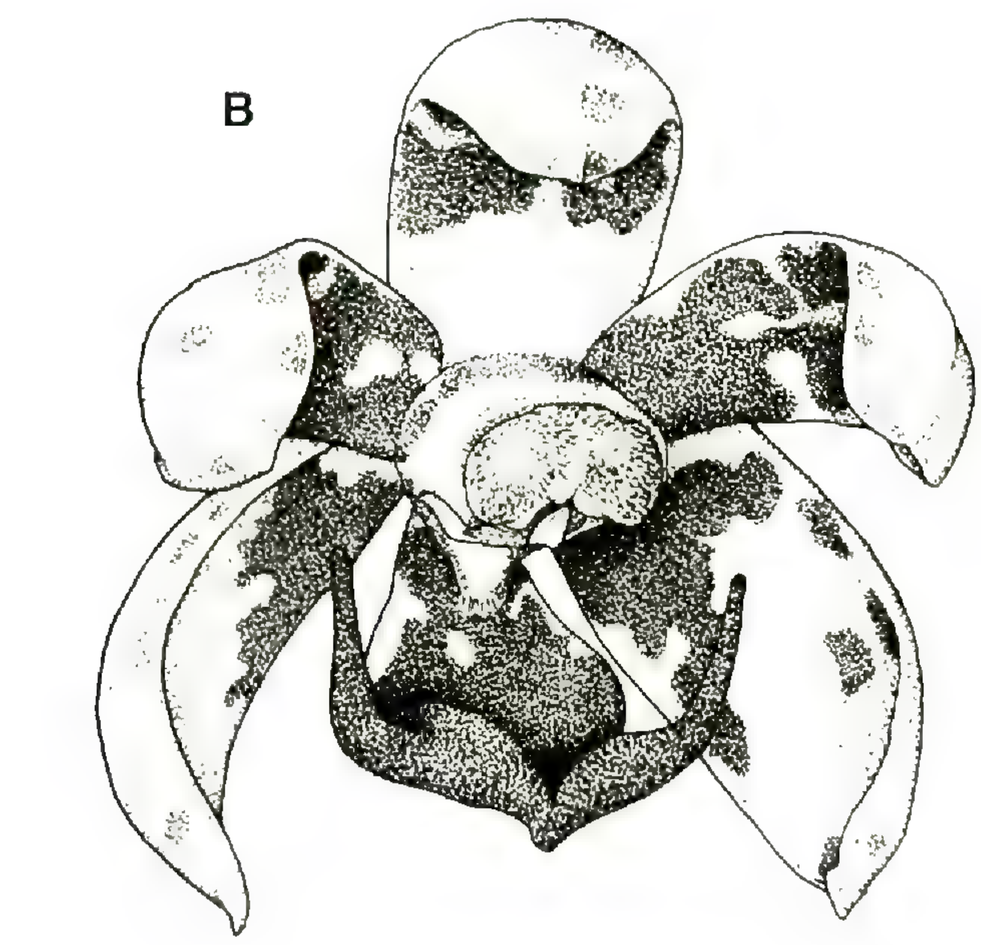
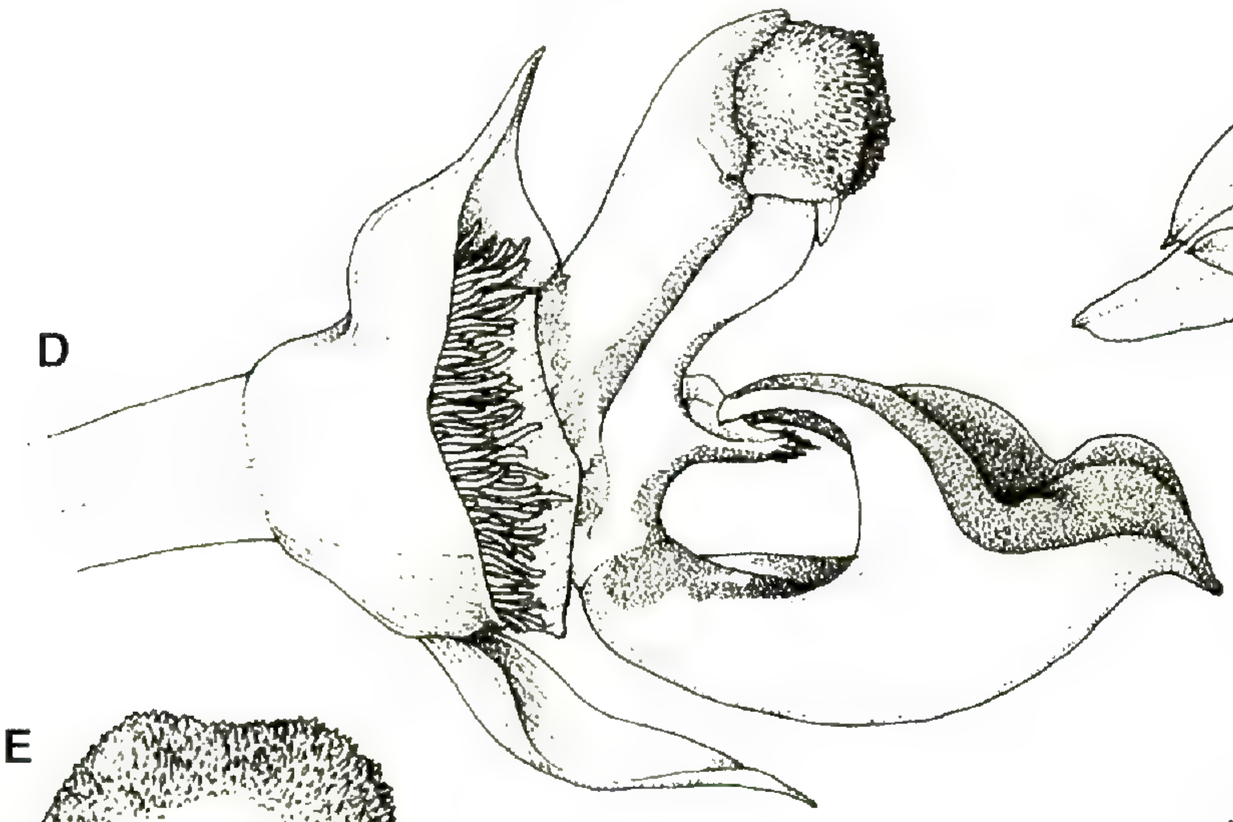


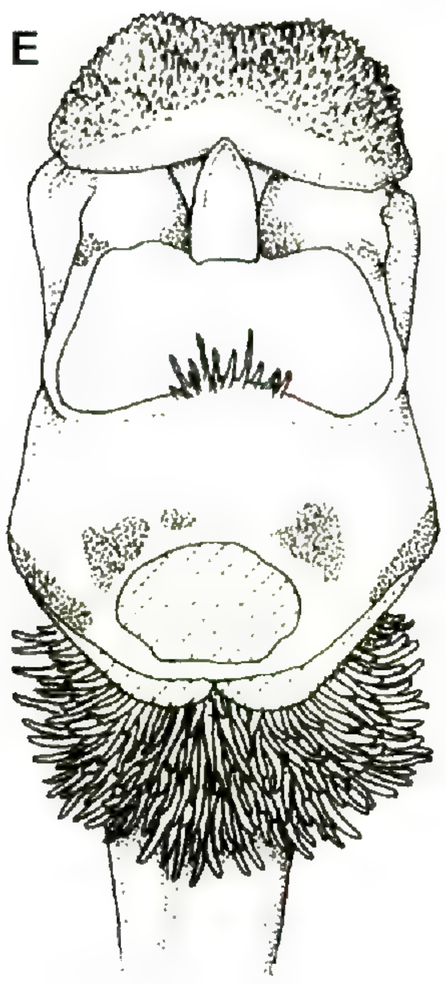
Figure 3. *Dichaea fragrantissima* subsp. *eburnea* Dressler & Pupulin. —A. Habit. —B. Flower. —C. Dissected perianth. —D. Column and lip, lateral view. —E. Column, ventral view. —F. Anther and pollinarium. Drawn from *Blanco 513* (USJ).

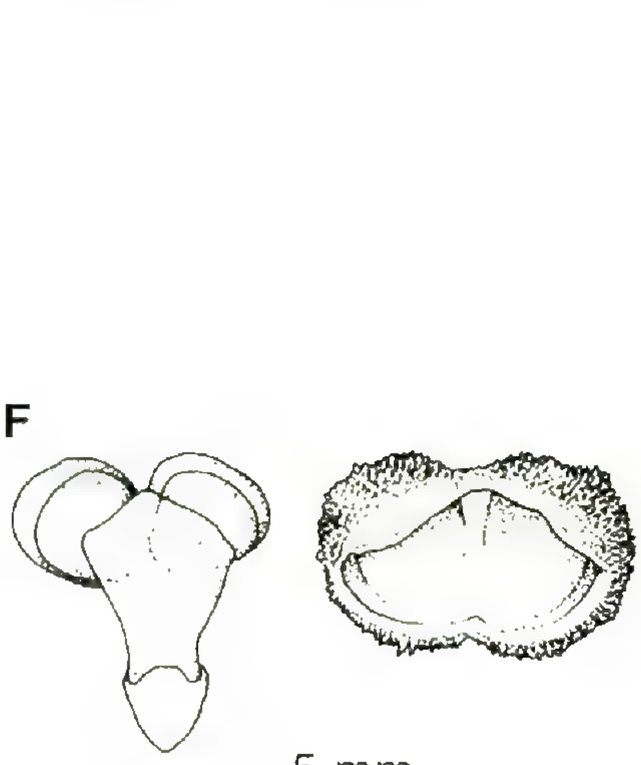
cate, lateral lobes 4–5 mm long, falcate; column 6–7 mm long, with prominent foot, ligule ca. 3 × 2 mm, triangular; ovary ca. 2 mm long, muricate, capsule ca. 21 × 17 mm, subglobose-oblong, muricate.

Within Mesoamerica, this new species is immediately distinguished from *Dichaea morrisii* by the fleshy, subtruncate lip, by the very broad claw of the lip, and by the distinctly obovate, apiculate petals. In









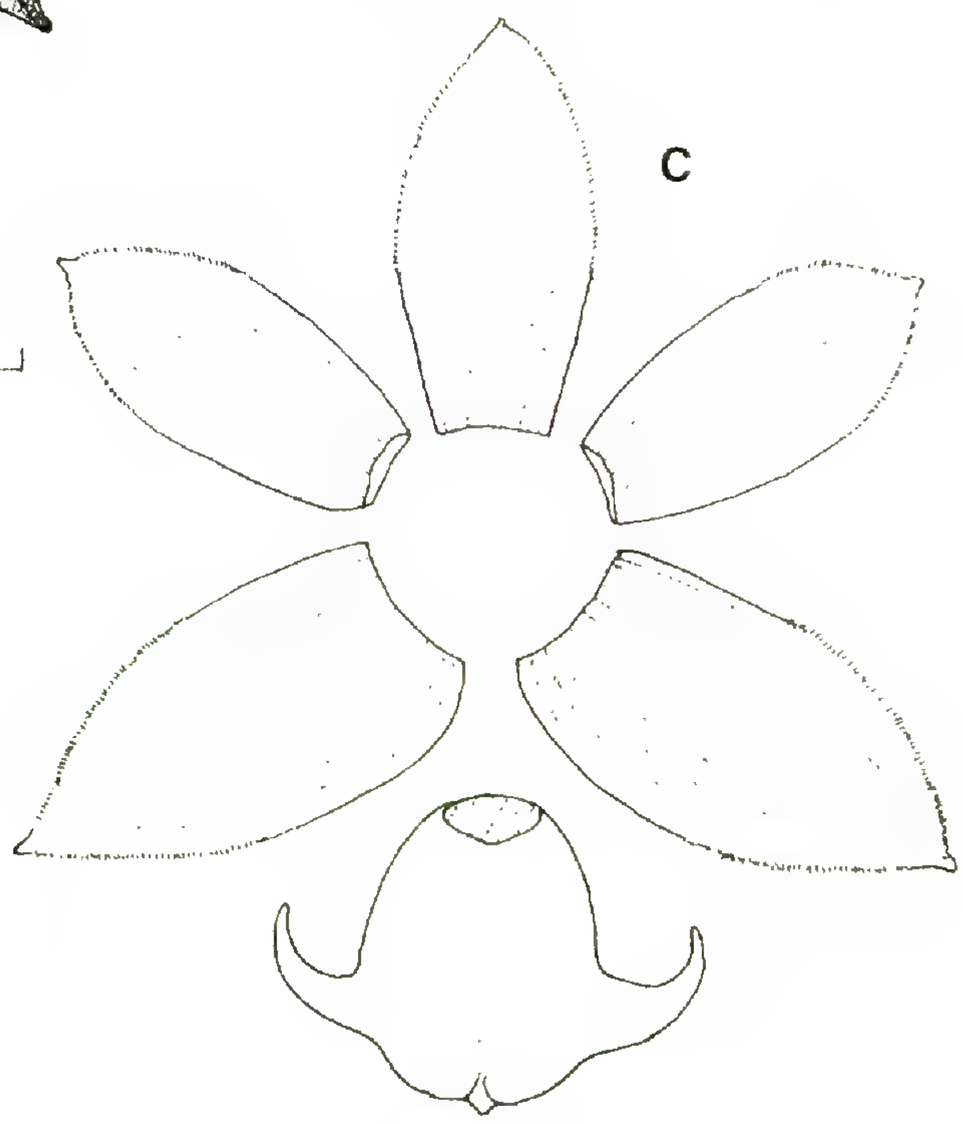


Figure 1. *Dichaea globosa* Dressler & Pupulin. —A. Habit. —B. Flower. —C. Dissected perianth. —D. Column and lip, lateral view. —E. Column, ventral view. —F. Pollinarium and anther. Drawn from *Pupulin, Castelfranco, Cribb & Dressler 3165*.

Ecuador, Peru, and Bolivia, the lip of *D. morrisii* is fleshier, is subtruncate, and has a much wider claw (Dodson & Dodson, 1980; Dodson & Vásquez, 1989), thus leading Dressler to use the name *D. robusta* Schlechter (based on a Bolivian plant) for the Central American *D. globosa*. However, the shape of the petals, the color pattern, and the distinct callus at the base of the lip all indicate that the South American plants are more closely allied to *D. morrisii* than to *D. globosa*. Until the variation pattern in South America is better understood, we consider *D. robusta* to be a synonym of *D. morrisii*. The plants of *D. morrisii* of Costa Rica, Venezuela, and Colombia agree very closely with West Indian *D. morrisii*. *Dichaea globosa* is a plant of the Pacific slope, and probably of drier forests than either *D. morrisii* or *D. fragrantissima*.

Distribution, habitat, and phenology. Costa Rica and western Panama at 700–1200 m elevation; flowering all year.

Paratypes. COSTA RICA. **Puntarenas:** Aguirre: rd. from Quepos to San Marcos de Tarrazu, *F. Pupulin 2639, D. Castelfranco & J. Cambronero* (USJ); Savegre, Quebrada Arroyo, *F. Pupulin, D. Castelfranco, P. Cribb, R. L. Dressler 3165* (USJ-spirit); Coto Brus, Zona Protectora Las Tablas, Las Alturas de Cotón, *F. Pupulin 4517, H. León-Páez & A. C. Rodríguez* (USJ); SE of San Vito, *R. L. Dressler 6408* (MO); Cantón de Osa, Rancho Quemado, Sector este, Sierpe, ca. de una laguna, *J. Marín y F. Quesada 273* (CR, MO). **San José:** Pérez Zeledón, Fila Costeña, Zapote de Pejivalle, *F. Pupulin 2639 & D. Castelfranco, J. Cambronero* (USJ); Dota, Crest of Cerro Nara, pressed from cult., *F. Pupulin 1124, D. Castelfranco & M. L. Spadari* (MO), *F. Pupulin 1123, M. L. Spadari & McFarland* (USJ), *F. Pupulin et al. 2080* (USJ); Nubes de Quizarrá, *F. Pupulin 1189, D. Castelfranco & M. L. Spadari* (USJ); La Unión General, *C. H. Lankester s.n.* (AMES). PANAMA. **Chiriquí:** Potrerillos, *A. Maduro y J. Nuñez 220* (MO).

Literature Cited

Dodson, C. H. & P. M. Dodson. 1980. Orchids of Ecuador. Icon. Pl. Trop., Ser. I. 1: plate 043.

——— & R. Vásquez. 1989. Orchids of Bolivia. Icon. Pl. Trop., Ser. II. 4: plate 318.

Dressler, R. L. 2005. H. G. Reichenbach, 19th Century Orchid Thief? Epidendrum 25: 14.

——— & J. Folsom. 2005. Proposal to reject the name *Cymbidium muricatum* (Orchidaceae). Taxon 54: 1106–1107.

Folsom, J. P. 1994a. Pollination of a fragrant orchid. Orchid Digest 58: 83–99.

———. 1994b. *Dichaea* discoveries. Notes on the pendent plants from Costa Rica and Panama. Orchid Digest 58: 185–191.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. D. Figueiras, D. H. Nicholson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editor). 2000. International Code of Botanical Nomenclature (St. Louis Code). Regnum Veg. 138.

Nir, M. 2000. Orchidaceae Antillanae. DAG Media Publishing, New York.

Five New Subspecies of *Braya* (Brassicaceae) from Canada

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Abstract. Five new Canadian subspecies of *Braya* are described and illustrated, three within *B. humilis* (C. A. Meyer) B. L. Robinson (subsp. *ellesmerensis* J. G. Harris, subsp. *maccallae* J. G. Harris, and subsp. *porsildii* J. G. Harris), one within *B. glabella* Richardson (subsp. *prostrata* J. G. Harris), and one within *B. thorild-wulffii* Ostenfeld (subsp. *glabrata* J. G. Harris). Keys to the North American subspecies of *B. humilis*, *B. glabella*, and *B. thorild-wulffii* are provided. Brief comments about the possible phylogenetic and phytogeographic significance of the subspecies of *B. humilis* are presented.

Résumé. Cinq nouvelles sous-espèces canadiennes de *Braya* sont décrites et illustrées, trois dans *B. humilis* (C. A. Meyer) B. L. Robinson (subsp. *ellesmerensis* J. G. Harris, subsp. *maccallae* J. G. Harris, et subsp. *porsildii* J. G. Harris), une dans *B. glabella* Richardson (subsp. *prostrata* J. G. Harris), et une dans *B. thorild-wulffii* Ostenfeld (subsp. *glabrata* J. G. Harris). Des clés aux sous-espèces de l'Amérique du Nord de *B. humilis*, *B. glabella*, et *B. thorild-wulffii*, sont données. Des commentaires brèves concernant la signification phylogénétique et phytogéographique possibles de la sous-espèce *B. humilis* sont présentés.

Key words: Brassicaceae, *Braya*, Canada, IUCN Conservation Status, *Neotorularia*, North America, *Platypetalum*, *Sisymbrium*, *Torularia*.

Specific and infraspecific classification in the polymorphic and taxonomically difficult genus *Braya* Sternberg & Hoppe (Brassicaceae, Sisymbrieae) is fraught with peril. Isolated populations often appear initially to be sufficiently distinct to warrant taxonomic recognition, and this has led to a long list of specific, subspecific, and varietal epithets in the genus (tables 1 & 2: Harris, 1985). Too often, however, most of these epithets are difficult or impossible to apply in practice. When the full range of morphological variation is examined, the majority of these proposed species and infraspecific taxa coalesce into a bewildering array of overlapping forms. As a result, most recent taxonomic treatments of *Braya* tend to be quite conservative, some avoiding infraspecific designations altogether (e.g., Rollins, 1993).

While a conservative taxonomic approach in *Braya* is probably appropriate and consistent with molecular-based phylogenetic studies (Warwick et al., 2004), completely ignoring infraspecific variation in the genus seems counterproductive. Some *Braya* species can be reliably subdivided into distinctive elements that may be biologically and phylogenetically significant. Subsuming these elements into an overly broad classification scheme only obscures phylogenetic relationships in *Braya*.

In anticipation of a forthcoming treatment of the Brassicaceae for the *Flora of North America* project, this paper provides epithets for five previously unrecognized Canadian subspecies of *Braya*, three within *B. humilis* (C. A. Meyer) B. L. Robinson, and one each within *B. glabella* Richardson and *B. thorild-wulffii* Ostenfeld. All of the subspecies described here were informally proposed for infraspecific recognition as varieties of *Braya* (Harris, 1985), but never validly published. I have chosen the subspecies rank here instead in order to bring the nomenclature in *Braya* into conformity with treatments of other genera of the Brassicaceae in an upcoming volume of the *Flora of North America*.

1. Braya humilis (C. A. Meyer) B. L. Robinson, in A. Gray & S. Watson, Syn. Fl. N. Amer. I. 1: 141. 1895. Basionym: *Sisymbrium humile* C. A. Meyer, in Ledeb., Icon. Pl. 2: 16. 1830. *Torularia humilis* (C. A. Meyer) O. E. Schulz, Repert. Spec. Nov. Regni. Veg. Beih. 12: 390. 1922. *Neotorularia humilis* (C. A. Meyer) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 394. 1986. TYPE: Russia. Altai: in subsalsis siccis ad fluvios Kenlyk, Kan, Jebagan; ad fluvium Tchuja, Jul. 1826, *A. Bunge 1033* (holotype, LE).

Braya humilis is an extremely polymorphic species of wide distribution in arctic, subarctic, and montane regions of the Northern Hemisphere (Abbe, 1948; Hultén, 1971; Böcher, 1973; Appel & Al-Shehbaz, 2003). Morphological variation in *Braya* is apparently caused and maintained by polyploidy and inbreeding of isolated populations. North American populations

of *B. humilis* are tetraploid ($2n = 28$), hexaploid ($2n = 42$), octoploid ($2n = 56$), and decaploid ($2n = 70$) (Mulligan, 1965; Harris, 1985; Warwick et al., 2004). In some cases morphological form is correlated with ploidy level. Hexaploid populations, for example, tend to show more morphological variation than populations of other ploidy levels (Mulligan, 1965), ranging from small, delicate individuals to large, robust plants. In most cases, however, morphological form does not correlate with ploidy level (Harris, 1985).

Attempts to recognize seemingly distinctive forms of *Braya humilis*, most from discontinuous populations from eastern North America, at the species (Rydberg, 1907; Fernald, 1918; Sørensen, 1954), subspecies (Rollins, 1953; Böcher, 1950, 1956; Hultén, 1968), and variety (Fernald, 1918, 1937; Böcher, 1956; Boivin, 1968, 1969) ranks have generally proved difficult. Geographically separated populations often look quite different, but they generally grade into one another through a series of morphological intermediates. This is particularly true in western North America, where *B. humilis* populations tend to be more continuous.

Most of the morphological variation in *Braya humilis* in North America is best treated within the type subspecies. Three forms, however, are rather striking, and they are easily distinguished from other *B. humilis* populations. They are recognized here as three new subspecies.

All three new subspecies are restricted to locations in and near regions believed to have remained ice-free during the Pleistocene (Prest, 1969; Cody, 1971; Packer, 1971; Packer & Vitt, 1974; Wolf et al., 1979). Plants surviving in these glacial refugia may have played a role in the recolonization by *Braya humilis* of extensive portions of northern North America in postglacial times. *Braya humilis* subsp. *porsildii* and *B. humilis* subsp. *maccallae* may be particularly significant in this regard. Both are almost completely allogamous (Harris, 1985), in contrast to subspecies *humilis*, which is autogamous, both have flowers almost twice as large as those in other *B. humilis* subspecies, and both show reduced fruit maturation and seed set. In addition, both are tetraploid, the lowest ploidy level known in *B. humilis* (most populations of *B. humilis* subsp. *humilis* are hexaploid or octoploid, but a few decaploid and tetraploid populations are known). This pattern of allogamy in tetraploids with large flowers, reduced seed set, reduced fruit maturation, and narrow distribution (*B. humilis* subsp. *maccallae* and subsp. *porsildii*) and autogamy in higher polyploids with smaller flowers, normal seed set, consistent fruit development, and wider distribution (*B. humilis* subsp. *humilis*) follows closely the list of characters outlined by Ornduff (1969) as common in allogamous and autogamous plants. Perhaps these allogamous tetraploids of restricted distribution gave rise to some of the more widely distributed autogamous *B. humilis* populations of higher ploidy levels.

KEY TO THE NORTH AMERICAN SUBSPECIES OF *BRAYA HUMILIS*

1a. Siliques 1.2–1.8 mm wide, not torulose; stems simple, prostrate in fruit. . . . . subsp. *ellesmerensis*
1b. Siliques 0.6–1.2(–1.3) mm wide, usually somewhat torulose; stems simple or branched, ascending to erect in fruit.
2a. Petals usually less than 5 mm long; flowers usually developing fertile fruits; leaves often dentate or pinnatifid . . . . . subsp. *humilis*
2b. Petals usually more than 5 mm long; flowers often developing abortive fruits; leaves entire, seldom dentate or pinnatifid.
3a. Leaves and stems glabrescent to moderately pubescent . . . . . .subsp. *maccallae*
3b. Leaves and stems densely pubescent. . . . . .subsp. *porsildii*

1. Braya humilis subsp. **ellesmerensis** J. G. Harris, subsp. nov. TYPE: Canada. Nunavut: Ellesmere Island, Hazen Camp, level delta plain 1 1/2 mi. WSW of Camp, 28 July 1962, *D. B. O. Savile 4763* (holotype, DAO). Figure 1.

Brayae humili subsp. *humili* similis, sed caulibus prostratis et siliquis latioribus differt.

Perennial herbs 3–16 cm tall; stems simple, ascending in flower, becoming prostrate in fruit, purple or purple-tinged, moderately pubescent with biforked and simple hairs. Leaves basal and cauline, oblanceolate, petiolate or merely cuneate at the base, pinnatifid to entire, 7–45 × 1.5–6 mm, moderately pubescent with simple and biforked hairs, green to purple-tinged. Racemes 5- to 35-flowered, condensed in flower but elongating in fruit. Sepals (1.9–)2.5–4.2 × (1.1–)1.3–2.2 mm, pubescent with long simple and biforked hairs, green or purple-tinged; petals white or purple-tinged, distinctly and abruptly divided into a claw and broad blade, (3–)4–5.6 × (1.3–)2–3.3 (–3.8) mm. Siliques straight or curved, not at all or only weakly torulose, 9–25 × (1–)1.2–1.8(–2) mm; valves densely to moderately pubescent with simple and biforked hairs; septum often fenestrate with circular perforations at regular intervals longitudinally or with a narrow elliptical longitudinal split at the base, or both; style 0.3–1 mm long, stout; stigma capitate and broadly bilobed or less often not capitate and only weakly bilobed. Seeds 0.9–1.1 mm long, 0.5–0.7 mm wide. $2n = 42$, from the type collection (Mulligan, 1965).

Braya humilis subsp. *ellesmerensis* differs from other *B. humilis* subspecies in the broad siliques (to 1.8 mm vs. only to 1.3 mm), prostrate fruiting stems,

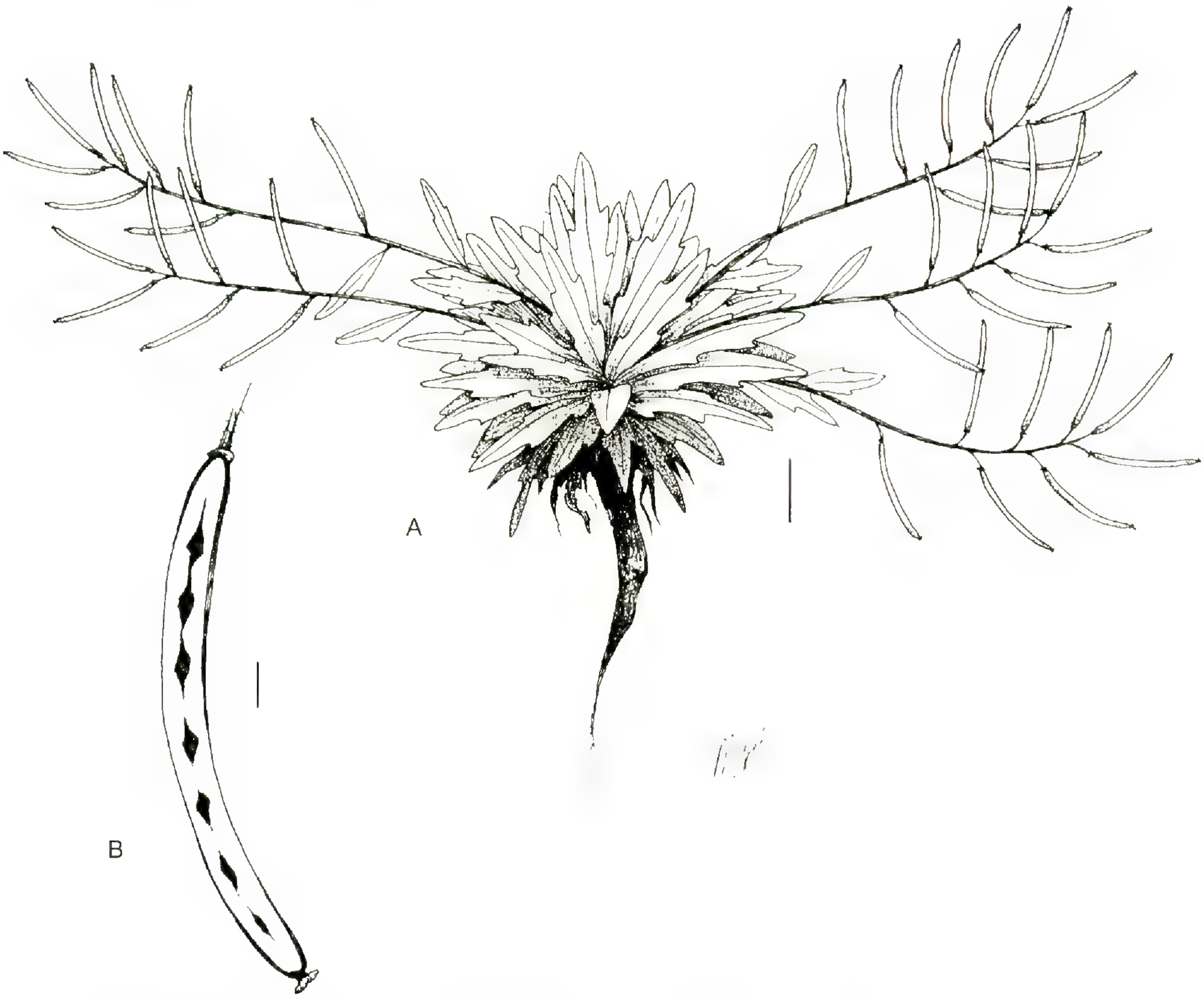

Figure 1. *Braya humilis* (C. A. Meyer) B. L. Robinson subsp. *ellesmerensis* J. G. Harris. —A. Plant. —B. Silique with valve removed. Scale: A = 1 cm; B = 1 mm. Drawn from the holotype (*D. B. O. Savile 4763*, DAO).

and fenestrate silique septae (the septae in other *B. humilis* subspecies lack fenestrations). In addition, the plants tend to be unusually robust compared to high Arctic representatives of subspecies *humilis*, with larger and more numerous leaves and stems. This taxon is endemic to sand, clay, and gravel slopes and plains of northern Ellesmere Island in the Canadian Arctic Archipelago. Due to its limited distribution, it should be considered for IUCN Conservation Status.

Paratypes. CANADA. **Nunavut, Ellesmere Island:** Fosheim Peninsula, *P. F. Bruggemann 831* (DAO); Hazen Camp, 3/4 mi. N of Camp, *D. B. O. Savile 4411* (DAO); head of Tanquary Fjord, *G. R. Brassard 1338, 1453* (CAN).

2. Braya humilis subsp. **maccallae** J. G. Harris, subsp. nov. TYPE: Canada. British Columbia: Yoho Nat. Park, flats of Kicking Horse River, opp. Mt. Stephen & E of Field, 24 June 1943, *W. C. McCalla 7539* (holotype, ALTA). Figure 2.

Differt a *Braya humili* subsp. *ellesmerensi* et subsp. *humili* petalis grandioribus et siliquis saepe abortivis, differt a *Braya humili* subsp. *porsildii* caulibus et foliis glabriusculis aut tantum modice pubescentibus.

Perennial herbs 4–23 cm tall; stems simple or sometimes branched, ascending to erect, moderately pubescent with biforked and simple hairs. Leaves basal and cauline, the basal leaves in a dense rosette, oblanceolate, rounded or narrowly obtuse, sessile with a cuneate base to distinctly petiolate, entire or occasionally sinuate-dentate, 5–50 × 1–7 mm, glabrescent to moderately pubescent with biforked and simple hairs, the cauline leaves often arising from near the base of the stem and much reduced. Racemes condensed in flower but elongating in fruit. Sepals 2.3–3.6 × 1.2–1.8(–2) mm, sparsely to moderately pubescent with long biforked and simple hairs, green to slightly purple-tinged; petals white or the claw occasionally purple-tinged, usually distinctly and abruptly divided into a claw and broad blade, (4.4–)4.9–6.7(–7.2) × (2.1–)2.3–4(–4.2) mm. Siliques more or less torulose, often aborted and undeveloped, 9–24 × 0.7–1.2 mm; valves moderately to densely pubescent with biforked and simple hairs; style (0.4–)0.7–1.3(–1.5) mm long, fairly stout; stigma not at all capitate to moderately capitate, entire to bilobed. Seeds 0.9–1.3 mm long, 0.45–0.65 mm wide, $n = 14$, *R. L. Taylor & D. H. Ferguson 2427* (Mulligan, 1965);

Figure 2. *Braya humilis* (C. A. Meyer) B. L. Robinson subsp. *maccallae* J. G. Harris. —A. Plant. —B. Silique. —C. Aborted silique. Scale: A = 1 cm; B, C = 1 mm. Drawn from the holotype (*W. C. McCalla 7539*, ALTA).

$2n = 28$, *J. G. Harris 1629* (ALTA), *J. G. Harris 1634* (ALTA).

Braya humilis subsp. *maccallae* is restricted to the Rocky Mountains of southern Alberta and British Columbia, where it is found on sandy, gravelly riverbanks and flood plains, and occasionally on glacial moraines. Its limited distribution indicates that it may be a candidate for IUCN Conservation Status. This subspecies differs from *B. humilis* subsp. *humilis* and subsp. *ellesmerensis* in its larger petals (up to 6.7 × 4 mm vs. only to 5.6 × 3.3 mm) and in its abortive siliques and from *B. humilis* subsp. *porsildii* in its glabrous to glabrescent leaves and stems.

Bernard Boivin annotated the type specimen in 1971 as "*Braya humilis* (C. A. Meyer) Rob. var. *McCallae* var. n." but the name was never published. The name honors W. C. McCalla, collector of several representative specimens of the subspecies, including the type specimen. The spelling of the epithet, "maccallae," is to be preserved. In addition to perhaps providing better pronunciation guidance in a word lacking capitalization, the spelling also follows Recommendation 60C.4(a) of the *International Code of Botanical Nomenclature*, which states that the Scottish patronymic prefix "Mc" "should be spelled 'mac' and united with the rest of the name."

Paratypes. CANADA. **Alberta:** Banff Nat. Park, flats at jct. of N Fork & W Br., Saskatchewan River, *S. Brown 1001* (GH, PH), *1006* (PH); on bank below the L. Louise–Jasper Rd., mi. 50, *W. C. McCalla 7076* (ALTA); Jasper Nat. Park, Sunwapta River, ca. mi. 50, *E. H. Moss 1852* (CAN); Sunwapta River nr. Beauty Ck., 23 June 1976, *I. Corns s.n.* (DAO); along Sunwapta River betw. Jasper & Banff, *A. Löve & D. Löve 6629* (DAO); 10 mi. NW of Columbia Glacier, *T. Mosquin & L. Mosquin 4691* (DAO); below Morro Peak along Athabaska River, *J. A. Calder & K. W. Spicer 33838* (DAO). **British Columbia:** Yoho Nat. Park, Kicking Horse River, ca. 2 km above Field, *J. G. Harris 1631* (ALTA, UVSC); sandy flats of Kicking Horse River opp. Mt. Stephen & E of Field, *W. C. McCalla 9566* (ALTA); on old gravel bar in Kicking Horse River, 3 mi. E of W Yoho Nat. Park gate, *R. L. Taylor & D. H. Ferguson 2427* (DAO); near Mt. Stephen Bung. Camp, *W. C. McCalla 7009* (ALTA); alluvial plain at head of Emerald Lake, *J. G. Harris 1629* (ALTA, UVSC), *W. C. McCalla 7452, 7030* (ALTA); Emerald Lake, *S. Brown 328* (PH), *J. Macoun 16* (PH); Kootenay Nat. Park, Lake McArthur, *F. K. Butters & E. W. D. Holway 153* (GH).

3. Braya humilis subsp. **porsildii** J. G. Harris, subsp. nov. TYPE: Canada. Alberta: Jasper Nat. Park, lateral moraines of Athabaska Glacier, 28 July 1946, *A. E. Porsild & A. J. Breitung 16335* (holotype, CAN). Figure 3.

Brayae humili subsp. *maccallae* affinis, differt caulibus et foliis dense pubescentibus.

Perennial herbs 3–17(–25) cm tall; stems simple or occasionally branched, ascending to erect or rarely decumbent, densely pubescent with biforked and simple hairs. Leaves basal and cauline, the basal leaves in a dense rosette, oblanceolate, rounded or narrowly obtuse, distinctly petiolate or merely cuneate at the base, usually entire but at times weakly sinuate-dentate, 3–30 × 1–5 mm, densely pubescent with biforked and simple hairs. Racemes condensed in flower but elongating in fruit. Sepals (2–)2.3–3.7 × (1.1–)1.3–1.8 mm, pubescent with biforked and simple hairs; petals white, distinctly and abruptly divided into a claw and broad blade, 4.4–6.9 × (1.9–)2.3–4.2 mm. Siliques ± torulose, often aborted and undeveloped, (8–)9–25 × 0.8–1.2 mm; valves densely pubescent with biforked and simple hairs; style 0.7–1.3(–1.5) mm long, fairly broad; stigma not at all capitate to moderately capitate, entire to bilobed. Seeds 1–1.3 mm long, 0.45–0.68 mm wide. $2n = 28$. *J. G. Harris 1553* (ALTA), *J. G. Harris 1639* (ALTA).

Braya humilis subsp. *porsildii* grows on calcareous gravels and soils on alpine scree slopes, glacial moraines, and gravelbars from the Rocky Mountains of southern Alberta and British Columbia north to about 65 degrees north latitude in the Mackenzie Mountains of the Northwest Territories of Canada. It differs markedly from *B. humilis* subsp. *humilis* and subsp. *ellesmerensis* in its larger flowers (up to 6.9 × 4.2 mm vs. only to 5.6 × 3.3 mm) and in its abortive siliques and from *B. humilis* subsp. *maccallae* in its densely pubescent leaves and stems.

This taxon was first recognized as unique by A. E. Porsild, who informally proposed the name *Braya restita* on several herbarium sheets, including the type specimen. This name, however, was never published and the epithet was subsequently applied by Hultén (1968) to his combination *Braya bartlettiana* Jordal var. *restita* Hultén. I have named the subspecies in honor of Porsild in recognition of his innumerable contributions to our understanding of northern plants.

Paratypes. CANADA. **Alberta:** Jasper Nat. Park, *H. M. Laing 291* (CAN); vic. of Athabasca Glacier, *A. E. Porsild & A. J. Breitung 14495* (CAN); Columbia Icefield, *H. J. Scoggan 16439* (CAN), 9 July 1975, *S. Kojima s.n.* (DAO); shoulder of Athabasca Mt., *E. H. Moss 1928* (ALTA, CAN); Banff Nat. Park, N Saskatchewan River at Saskatchewan Glacier, *B. Boivin 5083* (DAO); ridge betw. Mt. Athabaska & Saskatchewan Glacier, *A. E. Porsild & A. J. Breitung 14586, 14554* (CAN); Lake Louise, near Victoria Glacier, *A. E. Porsild & A. J. Breitung 15704* (CAN), *J. G. Harris 1639* (ALTA, UVSC); Nigel Pass, 28 July 1976, *I. Corns s.n.* (DAO); alpine slopes of Mt. Saskatchewan, *A. E. Porsild & A. J. Breitung 16060* (CAN). **British Columbia:** vic. of Summit Pass, Rocky Mts., *H. M. Raup & D. S. Correll 10564* (CAN); Alaska Hwy., N Tetsa River E of Summit at mi. 380, *J. A. Calder & I. Kukkonen 27395* (DAO); Stone Mtn. Prov. Park, Summit Lake, *J. G. Harris 1553* (ALTA, UVSC); just SW of Good Hope Road at mi. 66 on Cassiar Road, *J. A. Calder & J. M. Gillett 21769* (DAO); N of Muncho Lake at mi. 171 Alaska Hwy., *J. A. Calder & J. M. Gillett 25514* (DAO); along Toad River at mi. 132 Alaska Hwy., *J. A. Calder & J. M. Gillett 25343* (DAO); Graham River, *Mrs. J. V. Henry 501* (PH); below Mt. St. George at mi. 393 Alaska Hwy., *J. A. Calder & J. M. Gillett 26575* (DAO); Prospector's Valley, *F. K. Butters & E. W. D. Holway 139* (GH). **Northwest Territories:** Mackenzie Mts., *E. Krale & K. Haggard 227, 235* (DAO), *E. R. Rouslands 9* (DAO), *E. Krale & K. Haggard 14, 62* (DAO); Nahanni Nat. Park, *S. Talbot T6077-16* (DAO); S Nahanni River, Deadman Valley, *H. M. Kershaw 99* (DAO); Liard River, betw. Nahanni Butte and Simpson, *C. H. Crickmay 51* (CAN); Carcajou Range, Carcajou Lake, *W. J. Cody & F. M. Brigham 20510, 20951* (DAO); Carcajou Lake, Little Keele River, *P. M. Youngman & G. Tessier 725* (CAN).

Figure 3. *Braya humilis* (C. A. Meyer) B. L. Robinson subsp. *porsildii* J. G. Harris. —A. Plant. —B. Silique. —C. Aborted silique. —Scale: A = 1 cm; B, C = 1 mm. Drawn from the holotype (*A. E. Porsild & A. J. Breitung 16335*, CAN).

II. Braya glabella Richardson, Bot. App., Franklin's Narr. Journey Polar Sea, ed. 1, p. 743. 1823. *Braya alpina* var. *glabella* (Richardson) S. Watson, Bibliogr. Index N. Amer. Bot. 51. 1878. TYPE: Canada. Nunavut: Copper Mountains, 1820, *J. Richardson s.n.* (holotype, BM; isotype, GH).

Braya glabella Richardson subsp. *purpurascens* (R. Brown) W. J. Cody, Canad. Field-Naturalist 108: 93. 1994. Basionym: *Platypetalum purpurascens* R. Brown, Chloris Melvilliana p. 9 & 50. 1823. *Braya purpurascens* (R. Brown) Bunge ex Ledebour, Flor. Ross. 1: 195. 1841. 1924. TYPE: Canada. Canadian Arctic Archipelago, Melville Island, 1820, *J. Ross s.n.* (holotype, BM).

Like *Braya humilis*, *B. glabella* is highly polymorphic, making the recognition of reliably distinguishable infraspecific entities difficult. *Braya*

Figure 1. *Braya glabella* Richardson subsp. *prostrata* J. G. Harris. —A. Plant. —B. Silicle. Scale: A = 1 cm; B = 1 mm. Drawn from the holotype (*D. B. O. Sarile 1764A*, DAO).

glabella subsp. *glabella* and *B. glabella* subsp. *purpurascens* (R. Brown) W. J. Cody were originally placed in different genera (Richardson, 1823; Brown, 1823), and subsequently they have often been recognized as separate species (Hooker, 1830; Torrey & Gray, 1838; Polunin, 1959; Welsh, 1974; Porsild & Cody, 1980). But even these seemingly well-differentiated taxa can be problematic and were not distinguished in ITS-based studies (Warwick et al., 2004). Populations from the high Arctic generally fall within the typical morphology of subspecies *purpurascens*, while populations from subarctic and montane regions usually have the morphology associated with subspecies *glabella*. In areas of overlap along the northern coast of continental North America and in the more southern portions of the Canadian Arctic Archipelago, however, it is not always possible to identify the two subspecies with certainty. Nonetheless, some populations of *B. glabella* from northern Ellesmere Island are sufficiently distinct from both subspecies *glabella* and *purpurascens* that they warrant taxonomic recognition as an additional subspecies.

Key to the North American Subspecies of *Braya glabella*

1a. Siliques oblong to narrowly oblong-lanceolate, 3.5–8.3 times longer than broad; racemes often loosely elongated in fruit . . . . . subsp. *glabella*

1b. Siliques ovate-elliptic to oblong-elliptic, rarely broadly oblong-lanceolate, 2.5–3.7 times longer than broad; racemes usually not loosely elongated in fruit, often compact.

2a. Stems ascending to erect; leaves usually somewhat fleshy, to 4 mm wide; fruits 5–10 mm; style 0.5–1.2 mm . . . subsp. *purpurascens*

2b. Stems decumbent to prostrate, occasionally weakly ascending; leaves not fleshy, to 6 mm wide; fruits 8–12 mm; style 0.8–1.8 mm . . . . . subsp. *prostrata*

1. Braya glabella subsp. **prostrata** J. G. Harris, subsp. nov. TYPE: Canada. Nunavut: Ellesmere Island, Hazen Camp, level delta plain 1 1/2 mi. WSW of Camp, 28 July 1962, *D. B. O. Sarile 1764A* (holotype, DAO). Figure 4.

Differt a *Braya glabella* subsp. *glabella* et subsp. *purpurascenti* caulibus prostratis et foliis latioribus tenuioribus.

Perennial herbs 3.5–15 cm tall from a thick taproot, the caudex simple or branched; stems simple, decumbent to prostrate or weakly ascending, moderately to densely pubescent with long simple or at times biforked hairs. Leaves basal with an occasional single bractlike cauline leaf, the basal leaves usually broadly spatulate, not particularly fleshy, rounded or narrowly obtuse, entire, 9–45 × 1.5–6 mm, glabrescent with a few scattered long, simple or rarely biforked hairs mainly along the margins; leaf bases broadly expanded and often wider than the leaf blades, membranous. Racemes condensed in flower but elongating in fruit. Sepals 2.4–3.7(–4) × (1–)1.4–2 mm, glabrescent with a few scattered long, simple hairs; petals white to purple-tinged, (3–)3.5–4.7 × 1.6–3(–3.2) mm. Siliques oblong-elliptic to broadly

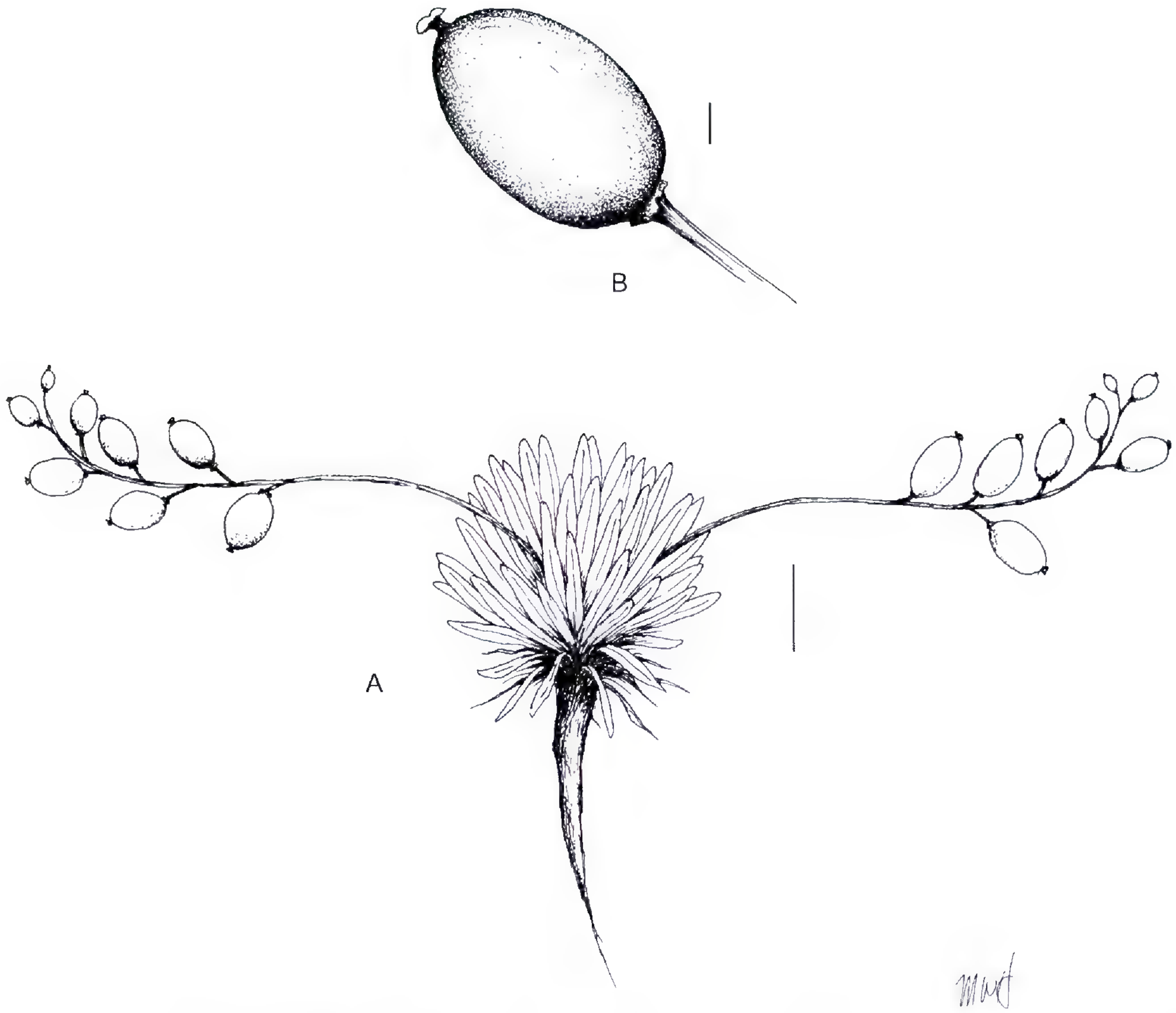

Figure 5. *Braya thorild-wulffii* Ostenfeld subsp. *glabrata* J. G. Harris. —A. Plant. —B. Silicle. Scale: A = 1 cm; B = 1 mm. Drawn from the holotype (*W. J. Maher & S. MacLean cat. no. 139*, CAN).

oblong-lanceolate, straight or curved, not torulose, (6.8–)8–12 × 2.5–3.6 mm; valves sparsely to moderately pubescent with stiff simple or occasionally biforked hairs; style 0.8–1.8 mm long, stout; stigma capitate to not at all capitate, bilobed to subentire. Seeds 1.4–1.7 mm long, 0.7–0.9 mm wide. $2n = 56$, from the type collection (Mulligan, 1965).

Braya glabella subsp. *prostrata* is distinguished from subspecies *glabella* by its non-fleshy and broader leaves (to 6 mm vs. to 4 mm), prostrate stems, and fruits 2.5–3.7 times longer than broad (vs. 3.5–8.3 times longer than broad). It is distinguished from subspecies *purpurascens* by its prostrate stems, non-fleshy and broader leaves (to 6 mm vs. to 4 mm), larger fruits (to 12 mm vs. to 10 mm), and longer styles (to 1.8 mm vs. to 1.2 mm). It is found on barren slopes and plains on northern Ellesmere Island in the Canadian Arctic Archipelago. The limited distribution of this taxon warrants its consideration for IUCN Conservation Status.

Paratypes. CANADA. **Nunavut, Ellesmere Island:** Fosheim Penin., Slidre Fjord, *S. D. MacDonald 297* (CAN); Fosheim Penin., *P. F. Bruggemann 835* (DAO); Eureka, *P. F. Bruggemann 818* (DAO).

III. Braya thorild-wulffii Ostenfeld, Meddel. Grønland 64, 176. 1923. *Braya purpurascens* (R. Brown) Bunge ex Ledebour subsp. *thorild-wulffii* (Ostenfeld) Hultén, Circum. Plants II. 18. 1970. *Braya purpurascens* var. *thorild-wulffii* (Ostenfeld) Boivin, Le Natur. Canadien 94: 646. 1967. *Braya pilosa* Hooker subsp. *thorild-wulffii* (Ostenfeld) Petrovsky, Flora Arct. URSS. 52. 1975. TYPE: Greenland. Gunnar Anderson Valley, 11 July 1917, *Th. Wulff s.n.* (holotype, C not seen; isotype, GH not seen).

Braya thorild-wulffii is a distinctive high arctic endemic of North America. Mature individuals are easily distinguished from *B. glabella* by the combination of decumbent habit, ovoid silicles, and extremely short styles (only to 0.75(1) mm vs. to 1.8(2) mm) and from *B. pilosa* Hooker by the much smaller flowers (only to 3.7 mm vs. to 6.6 mm), decumbent scapes, and short styles (only to 0.75(1) vs. to 2 mm). Throughout

most of its range in northern Greenland and the Canadian Arctic Archipelago, *B. thorild-wulffii* has densely pubescent inflorescences and fruits. Plants from the southern limits of its range on Banks and Victoria Islands in Northwest Territories and Nunavut, however, have glabrous to glabrescent inflorescences and fruits and are designated here as a new subspecies.

Key to the North American Subspecies of *Braya thorild-wulffii*

1a. Stems, pedicels, sepals, and silicles densely pubescent . . . . . subsp. *thorild-wulffii*
1b. Stems, pedicels, sepals, and silicles glabrous or glabrescent. . . . . .subsp. *glabrata*

1. Braya thorild-wulffii subsp. **glabrata** J. G. Harris, subsp. nov. TYPE: Canada. Northwest Territories: Banks Island, Bernard River, 6 Aug. 1963, *W. J. Maher & S. MacLean cat. no. 139* (holotype, CAN). Figure 5.

Brayae thorild-wulffii subsp. *thorild-wulffii* similis, sed inflorescentiis et siliculis glabris vel glabriusculis differt.

Perennial herbs (3–)5–9(14) cm tall from a long taproot; stems 1 to many, simple, decumbent to prostrate or occasionally ascending, often bent or wavy, glabrous or glabrescent, green to purple-tinged. Leaves basal with an occasional single bractlike cauline leaf, the basal leaves spatulate to linear-spatulate, obtuse, entire, (5–)10–30(–40) × 1–4 mm, ciliate with long mostly simple hairs and often with a tuft of hairs at the apex, green to purple-tinged; leaf bases membranous and broadly expanded near point of attachment. Racemes of 3 to 10 flowers, condensed in flower but elongating in fruit, the pedicels spreading-erect, almost nonexistent in flower, 1.5–4 mm long in fruit. Sepals 2–3.5 × 1–2 mm, obtuse, glabrous to glabrescent, green to purple-tinged; petals scarcely longer than the sepals, 2–3.7 × 1–1.5 mm, not distinctly divided into a claw and blade, but tapering gradually from the narrow blade to the base, white to purplish white. Silicles ovoid to globose, not torulose, (4–)5–8(–10) × (2.5–)3–5 mm; valves glabrous to glabrescent; style short, from almost nonexistent to 0.75(1) mm long, stout; stigma broadly bilobed to entire. Seeds (1.1–)1.2–1.4(–1.5) mm long, (0.5–)0.7–0.8(–0.95) mm wide.

Braya thorild-wulffii subsp. *glabrata* is known from Banks and Victoria Islands in the Canadian Arctic Archipelago, where it grows on dry sands and clays.

A. E. Porsild informally proposed this taxon as a new variety on the type specimen. His handwritten annotation reads, "*Braya Thorild-wulffii* Ostenf. n. var. *glabrata* Porsild (sched.)," but the name was not published. I agree with Porsild that these allopatric, glabrous populations of *B. thorild-wulffii* warrant infraspecific recognition.

Paratypes. CANADA. **Northwest Territories:** Banks Island, *G. W. Scotter & S. C. Zoltai 31227* (DAO). **Nunavut:** Victoria Island, *W. D. Stretton 18* (DAO).

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Literature Cited

Abbe, E. C. 1948. *Braya* in boreal eastern America. Rhodora 50: 1–15.

Appel, O. & I. A. Al-Shehbaz. 2003. Cruciferae. Pp. 75–174 *in* K. Kubitzki (editor), Families and Genera of Vascular Plants, Vol. 5. Springer-Verlag, Berlin.

Böcher, T. W. 1950. Contributions to the flora and plant geography of West Greenland II. Meddel. Grønland 147, No. 7: 1–39.

———. 1956. Further studies in *Braya humilis* and allied species. Meddel. Grønland 124, No. 7: 1–29.

———. 1973. Interspecific hybridization in *Braya* (Cruciferae). Ann. Bot. Fenn. 10: 57–65.

Boivin, B. 1968. Flora of the prairie provinces. Phytologia 16: 219–339.

———. 1969. Flora of the prairie provinces. Phytologia 17: 58–292.

Brown, R. 1823. Chloris Melvilliana. W. Clowes, London.

Cody, W. J. 1971. A phytogeographical study of of the floras of the continental Northwest Territories and Yukon. Naturaliste Canad. 98: 145–158.

Fernald, M. L. 1918. Some North American representatives of *Braya humilis*. Rhodora 20: 201–203.

———. 1937. No title. Rhodora 39: 276.

Harris, J. G. 1985. A Revision of the Genus *Braya* (Cruciferae) in North America. Ph.D. thesis [unpublished]. University of Alberta, Edmonton.

Hooker, W. J. 1830. Flora Boreali-Americana, Vol. I. H. G. Bohn, London.

Hultén, E. 1968. Comments on the flora of Alaska and Yukon. Ark. Bot. 7: 1–47.

———. 1971. The Circumpolar Plants. II. Kungl. Svenska Vetensk.-Akad. Handl. Fjärde Ser. Band 13, No. 1. Almqvist & Wiksell, Stockholm.

Mulligan, G. A. 1965. Chromosome numbers of the family Cruciferae. II. Canad. J. Bot. 43: 657–668.

Ornduff, R. 1969. Reproductive biology in relation to systematics. Taxon 18: 121–133.

Packer, J. G. 1971. Endemism in the flora of western Canada. Naturaliste Canad. 98: 131–144.

——— & D. H. Vitt. 1974. Mountain Park: A plant refugium in the Canadian Rocky Mountains. Canad. J. Bot. 52: 1393–1409.

Polunin, N. 1959. Circumpolar Arctic Flora. Clarendon Press, Oxford.

Porsild, A. E. & W. J. Cody. 1980. Vascular Plants of Continental Northwest Territories, Canada. National Museum of Natural Sciences, National Museums of Canada, Ottawa.

Prest, V. K. 1969. Retreat of Wisconsin and Recent Ice in North America. Geological Survey of Canada, Dept. of Energy, Mines and Resources, Map 1257-A.

Richardson, J. 1823. *In* J. Franklin, Narrative of a Journey to the Shores of the Polar Sea in the Years 1819, 20, 21, and 22. Botanical Appendix. J. Murray, London.

Rollins, R. C. 1953. *Braya* in Colorado. Rhodora 55: 109–116.

———. 1993. The Cruciferae of Continental North America. Stanford Univ. Press, Stanford.

Rydberg, P. A. 1907. The genus *Pilosella* in North America. Torreya 7: 157–162.

Sørensen, T. 1954. New species of *Hierochloe*, *Calamagrostis*, and *Braya*. Meddel. Grønland 136, No. 8: 1–24.

Torrey, J. & A. Gray. 1838. A Flora of North America, Vol. 1, Part 1. G. & C. Carvill, New York.

Warwick, S. I., I. A. Al-Shehbaz, C. Sauder, J. G. Harris & M. Koch. 2004. Phylogeny of *Braya* and *Neotorularia* (Brassicaceae) based on nuclear ribosomal internal transcribed spacer and chloroplast *trn*L intron sequences. Canad. J. Bot. 82: 376–392.

Welsh, S. L. 1974. Anderson's Flora of Alaska and Adjacent Parts of Canada. Brigham Young Univ. Press, Provo, Utah.

Wolf, S. J., J. G. Packer & K. E. Denford. 1979. The taxonomy of *Minuartia rossii* (Caryophyllaceae). Canad. J. Bot. 57: 1673–1686.

The Genus *Callitriche* (Callitrichaceae) in Asia

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Abstract. Taxonomic review is provided for *Callitriche* taxa occurring in central and eastern Asia east of the Urals and in southeastern Asia north of Irian Jaya Barat. Three new species: *Callitriche fuscicarpa*, *C. glareosa*, and *C. raveniana* are described from Nepal, Bhutan, and Taiwan, China, respectively. Two new varieties are also described: *Callitriche palustris* L. var. *megalata* from Siberia in Russia and *Callitriche palustris* L. var. *strumosa* from western Sumatra in Indonesia. *Callitriche nana* is newly referred as a synonym of *C. japonica* Engelmann ex Hegelmaier. *Callitriche oryzetorum* Petrov is transferred and reduced in rank to a variety of *C. palustris* L. *Callitriche wightiana* Wallich in Wight is lectotypified.

Key words: Asia, *Callitriche*, Callitrichaceae.

Callitriche L. is a genus of monoecious, or in a single case (*C. petriei* R. Mason subsp. *petriei*), dioecious, plants, with flowers that are axillary and usually solitary but that may occur in various combinations in the same axil; the perianth is absent but a subtending pair of bracts may be present in some species. The fruits are schizocarps, separating into four mericarps, which are dry, winged or not, with wings from the inner fruit layer. The taxonomy and identification of *Callitriche* species are dependent almost entirely on reproductive features, although occasionally other details such as venation and leaf shape may also be useful.

In preparing the treatment of *Callitriche* for the English version of the *Flora of China* series, herbarium specimens were studied from an area in Asia extending from the Urals east to Kamchatka and Ussuriland in the Russian Far East and south to southern Indonesia but excluding the eastern province of Irian Jaya Barat. Populations from here and Papua New Guinea were excluded as they appear to have closer affinities with Australasian taxa of the genus (Merrill & Perry, 1941; Schotsman, 1985).

Three new species were identified: *Callitriche fuscicarpa* occurring in the Himalayas, from India through Nepal to southern China; *C. glareosa* represented by single specimens from Bhutan and Tibet; and *C. raveniana* apparently only occurring in Taiwan. *Callitriche palustris* L. was found to show strong variation, with extremes being described as var. *megalata* from Kamchatka in Russia, var. *strumosa* from islands in southeastern Asia, and var. *oryzetorum*, formerly described as *C. oryzetorum* Petrov, from southern China, Japan, and Taiwan.

Few accounts of the genus in Asia give due consideration to reproductive features and consequently there is much misidentification. Many accounts report *Callitriche stagnalis* Scopoli from Asia (Cheng & Ming, 1980; Kak & Javeid, 1982; Cook, 1996; Sarwar, 1998; Larsen, 2000), while Kak and Javeid (1982) also report *C. obtusangula* Le Gall and *C. truncata* Gussone. However, thorough review of herbarium material (Schotsman, 1985; Lansdown, 2006, in press) has failed to find any material of *C. stagnalis* east of the Urals, *C. obtusangula* east of the Mediterranean, or *C. truncata* east of the Black Sea. When possible, I have taken the literature into account in preparing this revision. However, problems with potential misidentification mean that the literature has mainly been used to clarify elements of distribution.

The information employed to prepare this revision derives from review of more than 400 specimens in BM, CGE, E, HAST, HIB, K, L, LE, MICH, MO, P, PE, PPI, TAI, TNM, and TNU. All descriptive and biometric data employed here are based on herbarium specimens collected in Asia, except for those relating to *C. palustris* var. *palustris*. The list of material studied indicates the number of specimens seen; however, where data were collected from only a small number of specimens, this is stated.

I have provided illustrations of the fruits of each taxon except where these are already available in the literature. I have provided a key to the identification of all taxa known to occur in the region, although only novelties are considered in the text.

Key to the *Callitriche* Species Found in Asia

1a. Fruits unwinged 2
1b. Fruits clearly winged 5
2a. Bracts lacking . . . . . *C. peploides* Nuttall
2b. Bracts present 3
3a. All leaves lingulate with only a single vein; bracts caducous . . . . . *C. subanceps* Petrov
3b. Some or all leaves expanded, 1- to many veined; bracts persistent 4
4a. Bracts as long and wide as ripe fruit; leaf venation simple . . . . . *C. palustris* L. var. *oryzetorum* (Petrov) Lansdown

4b. Bracts as long as but narrower than ripe fruits; leaf venation complex . . . . . *C. fuscicarpa* Lansdown
5a. Fruits widest in upper half, tapering from above midpoint to base 6
5b. Fruits widest at or near middle 7
6a. Bracts lacking; leaves 1- to 3-veined . . . . . *C. japonica* Engelmann ex Hegelmaier
6b. Bracts present; leaves 1- to many-veined . . . . . *C. palustris* L.
7a. Fruits winged only at apex . . . *C. glareosa* Lansdown
7b. Fruits winged all around 8
8a. Bracts lacking 9
8b. Bracts present 11
9a. Fruits less than 1 mm long; some fruits with pedicels more than 1 mm. . . . . *C. deflexa* A. Braun ex Hegelmaier
9b. Fruits more than 2 mm long; subsessile or with pedicels less than 1 mm 10
10a. All leaves with only one vein, leaves lingulate. . . . . *C. hermaphroditica* L.
10b. Leaves with 3 to many veins, with blade and petiole. . . . . *C. wightiana* Wallich in Wight
11a. Bracts less than 0.5 mm long . . . . . *C. raveniana* Lansdown
11b. Bracts more than 0.5 mm long 12
12a. Wing of fruits less than 1 mm . . . . . *C. fuscicarpa* Lansdown
12b. Wing of fruits more than 1 mm. . . . . *C. fehmedianii* Majeed Kak & Javeid

1. Callitriche fuscicarpa Lansdown, sp. nov. TYPE: Nepal. Tamur Valley, Walungchung Gola, in shallow pond, 19 July 1956, *J. D. A. Stainton 1045* (holotype, BM). Figure 1B.

Ab omnibus *Callitriches* speciebus Asiae fructu maturo rubribrunneo, circa omnino anguste alato, bracteis parvis praesentibus, stylis persistentibus differt.

Flowering plants submerged or with floating rosettes. Submerged leaves ± lingulate, 6–9.7 × 0.5–0.8 mm; those toward or at the surface expanded, spathulate with petiole longer than blade, blade 3.2–5.2 × 2.3–4.2 mm, petiole 2.9–5 mm long; venation complex, characterized by primary and secondary veins, plus additional sometimes branched loops and anastomosing veins outside the secondary veins. Flowers solitary in axils or occasionally 2 carpellate flowers opposed by a staminate flower; bracts persistent (0.80–)0.7–1.1 mm. Filaments (0.6–)1.8–2.3 mm, ± straight; anthers 0.3 × 0.3 mm; pollen 20–24 × 15–20 µm, yellow; styles persistent, erect to slightly spreading, 0.7–1.2 mm. Fruits 0.7–1.1 × 0.7–1 mm, as long as or slightly longer than wide, dark brown becoming reddish brown, with faint reticulate pattern, resembling that of fruits of *Callitriche palustris*; subsessile or on pedicel less than 1 mm; wing poorly developed or up to 0.08 mm at the apex and side.

Callitriche fuscicarpa differs from all species of *Callitriche* in Asia by the fruits being reddish brown to dark brown when ripe and narrowly winged all round, by the presence of small bracts, and by the persistent styles.

Distribution and habitat. I have found only very few specimens of *Callitriche fuscicarpa*; these would suggest that it is rare, although widely distributed, occurring between 1800 and 3500 m altitude in the Himalayas, in Uttaranchal Province in India and Nepal, east to Yunnan Province in China, with a single specimen from Hokkaido in Japan. There is no useful information on the habitat of this species.

Etymology. The epithet *fuscicarpa* refers to the brown fruits.

Paratypes. CHINA. **Yunnan Prov.:** Col de Lo-pin-chan, "Lan Kong," *J. M.Delavay* s.n. (P); *J. M. Delavay 3279* (P); E flank of the Lichiang Range, *G. Forrest 22575* (E, K, P); sine loc, *D. W. Liu 7139* (MO, NAS). INDIA. Uttaranchal, small lake above Ramri, *J. F. Duthie 4019* (K, MICH). JAPAN. **Hokkaido:** Kushiro River, *Faurie 8696* (P).

2. Callitriche glareosa Lansdown, sp. nov. TYPE: Bhutan. Thimpu Distr.: Daga-La on the N side of Lawgu, in wet gravelly hollows between rocks in very wet moorland, 4400 m, Sep. 1990, *J. R. I. Wood 7321* (holotype, E). Figure 1C.

A *Callitriche terrestri* fructu solum ad apicem alato, a *C. japonica* fructu in medio latissimo, a *C. raveniana* bracteis absentibus differt.

Plants terrestrial. Leaves spathulate; venation simple, generally with 1 primary and a pair of secondary veins. Flowers solitary, most frequently a carpellate flower opposed by a staminate flower; bracts lacking. Filaments straight, up to 0.5 mm; anthers 0.2 × 0.2 mm; pollen yellow, 22–26 × 19–23 µm; styles up to 0.6 mm, persistent, reflexed, but not appressed to side of fruits. Fruits 0.6–0.7 × 0.8–1 mm, slightly wider than high, black when ripe, faintly reticulate, expanded toward base, but not strumose; subsessile or with pedicel up to 0.6 mm; wing apical only 0.05–0.1 mm wide at apex.

Callitriche glareosa differs from *C. terrestris* by the fruits being winged only at the apex, from *C. japonica* by the fruits being widest in the middle, and from *C. raveniana* by the lack of bracts.

Distribution and habitat. I have seen only two specimens of *Callitriche glareosa*, the type specimen from Bhutan and one from Tibet. The type was collected from above 4000 m, and it is likely that the record from Tibet will have been made at a similarly high altitude.

Etymology. The epithet *glareosa* refers to the gravel habitat noted for the type collection.

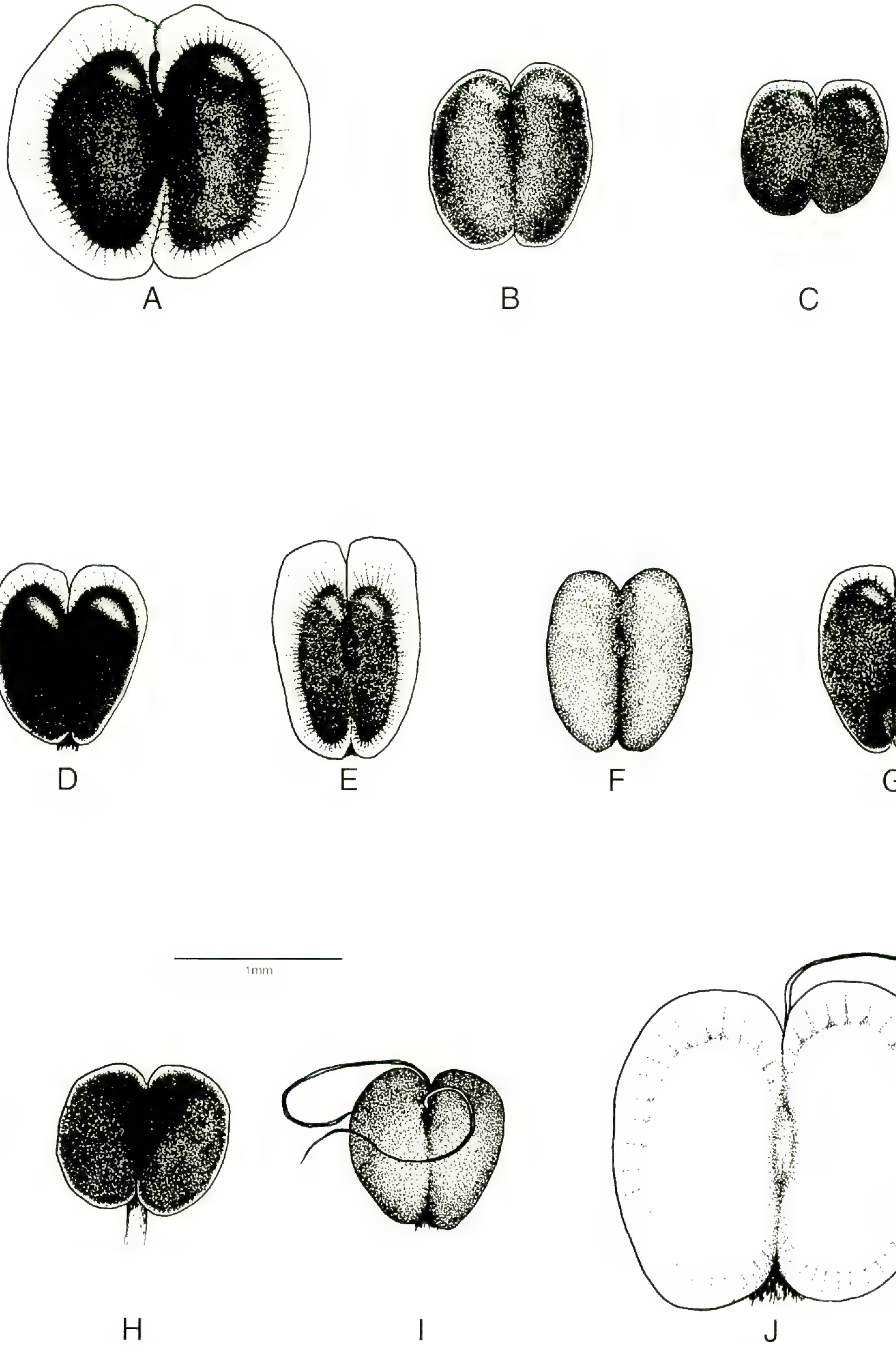

Figure 1. A–J. Fruits of Asian *Callitriche*. — A. *C. fehmedianii* (drawn from *Ducloux 517*, P). —B. *C. fuscicarpa* (drawn from *J. M. Delavay* s.n., P). —C. *C. glareosa* (drawn from *J. R. I. Wood 7321*, E). —D. *C. palustris* var. *elegans* (drawn from *Hu & But 21976*, K). —E. *C. palustris* var. *megalata* (drawn from *Á. Kiss* s.n., MICH). —F. *C. palustris* var. *oryzetorum* (drawn from *H. F. Hance 4321*, P). —G. *C. palustris* var. *strumosa* (drawn from *W. Meiner 6601A*, L). —H. *C. raveniana* (drawn from *C.-I. Peng 13917*, HAST). —I. *C. subanceps* (drawn from *I. Komarov* s.n., K). —J. *C. wightiana* (drawn from *R. Wight 7008*, K).

Paratype. CHINA. **Xizang Zizhiqu (Tibet):** *sin coll.* (PE 0901712).

3. Callitriche japonica Engelmann ex Hegelmaier, Verh. Bot. Ver. Prov. Brandenburg 10: 113–114. 1868. TYPE: Japan. Hokkaido: Hakodate [Hakodadi], *C. Wright s.n.* in U.S.N. Pacific Exped. 1853–1856 (holotype, MO 1913973; isotype, K).

Callitriche nana B. C. Ho & G. T. P. Vo, Floribunda Sisipan 2(3): 59. 2003. Syn. nov. TYPE: W Java, *W. J. De Wilde, Wiriadinata, Rugayah & P. Hovenkamp 22275* (holotype, BO not seen; isotypes, K, L, P).

Plants terrestrial. Leaves expanded, shiny, blades 1.5–4.5 × 1–2.5 mm, petiole 1–1.5 mm long; venation simple, generally limited to one primary and a pair of secondary veins with occasional short veins arising within and outside the secondary veins. Flowers solitary, most frequently a pair of axils with a carpellate flower opposed by a staminate flower; bracts lacking. Filaments 0.2–0.4 mm, ± straight; anthers 0.2 × 0.2 mm; pollen 13 × 15.4 µm; styles 0.28–0.33 mm, ± straight. Fruits 0.7–1 mm long × 0.7–1 mm wide, brown to blackish when ripe, tapering toward the base; wing 0.05–0.1 mm at the apex, 0.03–0.08 mm at the side.

Callitriche japonica differs from other *Callitriche* species in Asia in having the fruits winged all around and tapering from the apex toward the base and no bracts.

Backer (1954) recorded three forms of *Callitriche palustris*, of which the terrestrial form was represented by material collected by van Steenis from Tjibodas [Cibodas], West Java; the other two forms were associated with material from Papua New Guinea. In 2002, further material was collected from the Botanical Garden at Cibodas and described as a new species, *C. nana* B. C. Ho & G. T. P. Vo. Both the van Steenis material and isotypes of *C. nana* in K and L represent typical *C. japonica* and so the name *C. nana* is reduced here to synonymy with *C. japonica*.

Distribution and habitat. Callitriche japonica occurs in central and southern Japan (Yamazaki, 1993), as well as China from Fujian, Jiangxi, and Taiwan. There is herbarium material from northern Thailand, West Bengal (India), and Java (Indonesia). The last two records are from botanical gardens and could represent established aliens; however, more information is needed to establish the western and southern extremes of its range. *C. japonica* appears to be associated with disturbed ground and roads or tracks, in humid locations often in partial shade.

Additional specimens examined. CHINA. **Fujian [Fokien] Prov.:** *sine coll. 2700* (K). **Jiangxi [Kiangsi] Prov.:** (PE 0990315). INDIA. **W. Bengal:** Darjeeling Dist., Darjeeling, Lloyd Bot. Gardens, *D. G. Long, R. J. D. McBeath, H. J. Noltie, M. F. Watson ESIK 1047* (E). INDONESIA. **Java:** Tjibodas [Cibodas], *S. J. van Ooststroom 13073* (L), *J. F. Veldkamp 8616* (L), *G. G. J. van Steenis* s.n. (L). JAPAN. **Hokkaido:** *L. Savatier 426* (P). **Honshu:** Shimoda, *C. Wright* s.n. (K); *M. Hutoh 24811* (E, L, P). TAIWAN. Ilan Hsien, Pinglin, Shueide, *C.-h. Chen 3880* (HAST); Ilan Hsien, Tatung Hsiang, *Y.-c. Kao 400* (HAST); Ilan Hsien, Fushan Bot. Garden, *C.-I. Peng 13873*, (HAST); Taipei Hsien, Shih-ting Hsiang, Fei-tsui-shui-ku, *J.-c. Wang 11377* (HAST, TNU). THAILAND. Chang-mai, Lekong-yun [yuen] *R. P. Courtois 25605* (P).

4. Callitriche palustris L., Sp. Pl. 2: 969. 1753. TYPE: "Habitat in Europae fossis paludibus." lowermost three specimens on sheet (lectotype, designated by Lansdown & Jarvis (2004: 171), LINN 13.2).

Callitriche verna L., Fl. Suec. ed. 2: 2. 1755. TYPE: Uppermost three specimens on sheet (lectotype, designated by Lansdown & Jarvis (2004: 171), LINN 13.2).

Plants submerged, with floating rosettes or on wet mud. Lingulate leaves linear to narrowly expanded, emarginate, with a single vein (4–)5.6–9.7 × 0.5–1.2 mm; expanded leaves with blade elliptic to ± orbicular 3.6–9.9(–10.3) × 1.2–4.3(–4.5) mm; most leaves have at least part of a tertiary vein, they generally also have additional veins arising from secondary veins either as loops rejoining adjacent secondary veins or as short slightly curved veins pointing ± directly to blade margin.

Callitriche palustris occurs throughout much of the Northern Hemisphere but is generally restricted to high altitudes in the southern part of its range, from Iceland and Finland south to the Pyrenees (Lansdown, 2006, in press), east to Japan and Kamchatka in the Russian Far East. In North America it occurs from Greenland south to New Mexico (Fassett, 1951). It has also been recorded from Australia, where it may have been introduced (Aston, 1973).

KEY TO THE VARIETIES OF *CALLITRICHE PALUSTRIS* FOUND IN ASIA

1a. Fruits winged only at apex or lacking, wing up to 1 mm wide 2
1b. Fruits winged all around, wing at least 1 mm wide at apex 3
2a. Bracts caducous, styles and filaments to 1 mm long, caducous . . . . . .var. *palustris*
2b. Bracts persistent, styles to 1.7 mm, filament to 2.7 mm long, persistent . . . . . var. *oryzetorum*
3a. Wing at least 1.5 mm at apex and well developed at the base . . . . . var. *megalata*
3b. Wing less than 1.5 mm at apex, very narrow at base 4
4a. Styles persistent, fruits slightly strumose . . . var. *elegans*
4b. Styles caducous, fruits strongly strumose . . . var. *strumosa*

4a. **Callitriche palustris** L. var. **palustris**

Callitriche fallax Petrov, Izv. Glavn. Bot. Sada S.S.S.R. 27: 358. 1928. *Callitriche verna* var. *fallax* (V. Petrov) Hara in Bot. Mag. Tokyo 49: 866. 1935. TYPE: Russia. Kamchatka Peninsula, *V. L. Komarov. 2975* (holotype, LE, not seen).

Sarwar (1998) cites two specimens of *Callitriche palustris* in K, both of which belong to the nominate variety. In addition, a single specimen in BM is cited as *C. stagnalis*. This specimen also belongs to *C. palustris* var. *palustris*. It has not been possible to confirm the identity of other specimens cited as *C. stagnalis*, and until they can be formally determined, only this species *C. palustris* can be confirmed as occurring in Pakistan.

In Asia, *Callitriche palustris* var. *palustris* occurs in Kashmir, Himachal Pradesh, and Sikkim in India and in Nepal and Bhutan, throughout China, north to Siberia and Kamchatka in Russia, South Korea, and east to Japan. The taxon is apparently absent from areas to the south of the Himalayas and China.

Additional specimens examined. BHUTAN. Upper Mo Chu Dist.: Tharizan Chu, *I. W. J. Sinclair & D. G. Long 538* (E). CHINA. **Guangdong [Kwangtung] Prov.:** Whampoa, *T. Sampson 4321* (K, BM). **Hong Kong:** Lam Tsuen, N.T., *K. Y. Chan 1111* (K). **Jilin [Kirin] Prov.:** O-muhsien, *H. W. Kung 2186* (PE). **Quinghai [Tsinghai] Prov.:** Jimai [Gyümai] Ziang, Sainaniuda, Dari [Darlag] Xian, Huang He, *T. V. Ho, B. Bartholomew & M. Gilbert 1238* (K): Huangnan Zang Aut. Pref., Henan Mongol. Aut. Co., N of Henan Xian, Zêkog River, *D. G. Long, C. Bricknell, R. J. D. McBeath, E. J. Stranman, R. Steele, Y. F. Lu, D.-S. Deng & S.-R. Zhang 631* (E). **Sichuan Prov.:** Huang-ch'en-kuen, *H. Smith 3991* (K): *K. L. Chu 7929* (PE). **Xizang Zizhiqu [Tibet]:** Tsangpo Valley, Tammysu, *F. Ludlow, G. Sherriff & H. H. Elliot 14226* (K): Tungdo, Tsanpo Valley, Kongbo, *F. Ludlow, G. Sherriff & G. Taylor 4545* (K): Kulu Phu Chu, Paka, *F. Ludlow, G. Sherriff & G. Taylor 5945* (K): Tsangpo Valley, Tsela, *F. Ludlow, G. Sherriff & G. Taylor 5486* (K): Je [Pasum Lake] *F. Ludlow, G. Sherriff & H. H. Elliot 14133* (K, BM). **Zhejiang [Chekiang] Prov.:** Sungyang, *H. W. Kung s.n.* (PE). INDIA. **Himachal Pradesh:** between Sangla and Rakcham, *V. C. Vair 34302* (L). **Sikkim:** S of Dhzongri, Phedang, *D. G. Long, R. J. D. McBeath, H. J. Noltie & M. F. Watson ESK 722* (E). JAPAN. **Honshu:** Aomori Prov., *U. J. Faurie s.n.* (P): Kyoto Pref., Kamiike, Ikejiri, Umaji-cho, Kameoka-shi, *S. Tsugara 15824* (MO). **Hokkaido:** Sapparo, Yezo, *S. Arimoto s.n.* (MO). NEPAL. Phagune Dhuin, *J. D. A. Stainton, V. R. Sykes & L. Williams 4798* (K, BM): Everest region, Lobuche, Khumba glacier, *G. Miehe* s.n. (K, BM): Ghalike Pahar, *J. D. A. Stainton, V. R. Sykes & L. Williams 3764* (K, BM): Langtang, *O. Polunin 521* (BM): Chilime Kharka, *O. Polunin 1473* (BM): Jumla, *O. Polunin, V. R. Sykes & L. Williams 913* (BM, E): Longponga, *J. de Hass 3018* (L): Nyimagawa Plain, *J. de Hass 3070* (L). PAKISTAN. **Kashmir:** Kishinsar, *O. Polunin 56/671* (BM): Liddar Valley, Badzulkod nala, *J. F. Duthie 13414* (K): Yamharu Pass, *J. F. Duthie 13573* (K). RUSSIA. Kamchatka oblast: Schapino Village, River Kamchatka, *V. Komarov 2975* (LE). East Siberia, Tomskaya oblast: *A. V. Poloshii & S. V. Viginja s.n.* (MO). SOUTH KOREA. *U. Faurie 1791* (K, BM, E). TAIWAN. Han Hsien, Tatung Hsiang, Ssuchi Forest Road, *C.-I. Huang 90995* (HAST): Hsinchu Hsien, Chienshih Hsiang, Yuanjanghu N.R., *C.-I. Peng, 15163* (HAST).

4b. **Callitriche palustris** L. var. **elegans** (Petrov) Y. L. Chang, Fl. Pl. Herb. Chin. Bor.-Orient. 6: 53. 1977. Basionym: *C. elegans* Petrov, Bull. Jard. Bot. Prine. URSS 27: 360. 1928. TYPE: Russia. "Austro-Usuriensis ad fl. Sutshan prope pag. Vladimiro-Alexandovsk," 4 July 1913, *A. Bulavkina s.n.* (holotype, LE not seen). Figure 1D.

Callitriche bengalensis Petrov, Bull. Jard. Bot. Prine. URSS 27: 358. 1928. Syn. nov. TYPE: Bangladesh, *Griffith 2145* (holotype, LE).

Generally one carpellate and one staminate flower in one of a pair of axils opposed by a single carpellate flower in the other, very occasionally 2 carpellate flowers and a staminate flower in a single axil; bracts persistent, 0.8–1.2 mm, falcate. Filaments ± straight, caducous, rarely visible in axils below shoot apices, up to 2.2 mm; anthers 0.4 × 0.3 mm; pollen yellow, ovoid-ellipsoid, 21–26 × 17–25 µm; styles erect to slightly spreading, up to 1.5 mm long. Fruits 1–1.4 × 0.7–1.1 mm, widest above the middle, slightly strumose, black when ripe, mericarps sharply reticulate, the reticulations appearing ± clearly in vertical rows, wing 1–1.5 mm wide toward apex.

Callitriche palustris var. *elegans* differs from all other varieties of *C. palustris* in both the bracts and the styles being persistent and in the wing being 1–1.5 mm wide at the apex of the fruits and ± lacking from the base.

Distribution and habitat. *Callitriche palustris* var. *elegans* occurs from Bangladesh to the Baikal region in Russian Siberia, east to Sakhalin Island (Shishkin, 1974), south through Japan to the Ryukyu Islands as well as Jiangsi, Jilin, and Hong Kong in China. The only information available refers to *Callitriche palustris* var. *elegans* growing in nutrient-rich drainage ditches.

Additional specimens examined. CHINA. **Hong Kong:** Lam Tsuen, N.T., *Hu & But 21976* (K). **Jilin (Kirin) Prov.:** Kiriñeñsig Prov., Jehitu-deñsa Valley, betw. Ninuotà & Omōdo, *V. Komarov 1033* (K, BM). JAPAN. **Honshu:** Settsu, Nakayamadera in Kawanobegum, *M. Togasi TSM 795* (E): Settsu, Takarazuka, Hondo, *T. Makoto VSM 498* (L, MO). **Ryukyu Islands:** Amami-oshi m, Nase City, Uraami, Ryukyus, *S. Itusima & S. Sako 23876* (L). RUSSIA. Sutagi [Sungagi] River, *R. K. Maak s.n.* (LE): Sachalin oblast: Ins. Sachalin, *Augustinowicz s.n.* (LE): Zabaikalskaya oblast: Shilka River, Ust Kara, *Striutinskii & Blagovorusheno s.n.* (LE).

4c. **Callitriche palustris** L. var. **megalata** Lansdown, var. nov. TYPE: Russia, Eastern Siberia,

Primorskaja Distr., Nikolsk-Ussurisk, 20 Aug. 1917, *Á. Kiss s.n.* (holotype, MICH). Figure 1E.

Ab omnibus aliis *Callitriches palustris* varietatibus ala ad fructus apicem latiore quam 1.5 mm differt.

Generally one carpellate and one staminate flower in each axil, the staminate flower very briefly caducous and generally missing from axils below shoot apex; bracts caducous, ovoid, rounded, 0.2–1.2 mm. Filaments erect to gently curved, 1.5–1.8 mm; anthers 0.45 × 0.51 mm; pollen 21–25 × 19–20 µm, yellow, strongly ornamented; styles ± erect, 0.2–0.8 mm. Fruits 1.2–1.4 × 0.9–1 mm, higher than wide, dark with pale wing; subsessile, very broadly winged, mainly at apex and base; wing 2–2.6 mm wide at apex, 1.3–1.8 mm wide at side.

Callitriche palustris var. *megalata* differs from all other varieties of *C. palustris* in having the wing more than 1.5 mm wide at the apex of the fruits.

The description is based only on the type specimen. However, the characters of the wing are sufficiently different that I have no hesitation in describing it as a new variety of *Callitriche palustris*.

4d. Callitriche palustris L. var. **oryzetorum** (Petrov) Lansdown, comb. et stat. nov. Basionym: *C. oryzetorum* Petrov, Bull. Jard. Bot. Prince. URSS 27: 358. 1928. TYPE: [China.] "In oryzetis cantonensibus," Mar. 1867, *H. F. Hance 4321* (holotype, LE; isotypes, K, P). Figure 1F.

Generally, one carpellate and one staminate flower in each axil, very occasionally 2 carpellate flowers and a staminate flower in one axil; bracts persistent, 0.6–0.9(–1) mm, broadly ovoid. Filaments straight, 1.6–2.7 mm; anthers 0.4–0.5 × 0.3–0.4 mm; styles erect to spreading, less than 1.7 mm long. Fruits 0.7–1 × 0.6–0.8 mm, widest near the middle, ripe fruits brown, smooth; wing lacking, or less than 0.1 mm at apex, becoming narrower down the sides.

Callitriche palustris var. *oryzetorum* differs from all other varieties of *C. palustris* in the very large bracts and the persistent styles.

Distribution and habitat. Thought for a long time to be endemic to Guangdong Province, *Callitriche palustris* var. *oryzetorum* occurs mainly in southern China, from Yunnan through Fujian and Guangdong Provinces to Taiwan, and there is a single specimen in K from Japan. The only information available describes *C. palustris* var. *oryzetorum* as growing in a river and in ricefields.

Additional specimens examined. CHINA. **Fujian [Fukien] Prov.:** Peiyueang Hsiang, *H. Migo s.n.* (PE). **Yunnan Prov.:** Lichiang, near Ngu Leh Keh, *C. Schneider 1996* (K). Zhejiang [Chekiang] Prov.: sin coll. (PE 1514). JAPAN. **Kyushu:** Kogakura Reservoir, *N. Mackawa 9/39* (K). **Taiwan:** [Shinchiku-shu, Toyen]. *T. Tanaka & Y. Shimada 13530* (E, MICH, MO, PE).

4e. Callitriche palustris var. **strumosa** Lansdown, var. nov. TYPE: [Indonesia.] W Sumatra, Pesisir Selatan Kerintji Dist., Kerintji, Banto, Rawah Banto, marsh s.d., *W. Meiner 66014* (L). Figure 1G.

Ab omnibus aliis *Callitriches palustris* varietatibus fructus partis inferioris margine interiore in orcam tumido, a *C. peploide* fructu ab apice ad basin alato differt.

Generally one carpellate and one staminate flower in one of a pair of axils opposed by a single carpellate flower in the other; bracts persistent, 0.4–1 mm, falcate. Filaments ± straight, less than 0.5 mm, obscured by carpellate flowers; anthers much reduced, possibly aborted; pollen yellow; styles erect, ± widely spreading, 0.8–1.2 mm. Fruits 1–1.1 × 0.8–1 mm, widest above the middle, strongly strumose to extent that base of each mericarp is twisted, black when ripe, mericarps sharply reticulate, reticulations appearing ± clearly in vertical rows; wing mainly toward apex, but very narrow along sides, 0.1–0.2 mm wide at the apex and 0.03–0.07 mm wide on the side.

Callitriche palustris var. *strumosa* differs from all other varieties of *C. palustris* in the inner margin of the lower part of the fruits being swollen into a ridge and from *C. peploides* in the fruits being winged from apex to base.

Distribution and habitat. This variety is described from only two specimens, both in L. Apart from the obligate terrestrial taxa, *Callitriche* is normally represented in the tropics only at high altitude. Unusually one of the specimens cited here appears to have been collected in pools in a marsh on a coastal island, at sea level. No material of this variety is represented in collections from Irian Jaya or Papua New Guinea. With such limited material, it is difficult to explain its distribution. It is of note that Backer (1954: 252) refers to *Callitriche* sp. "mentioned by Kurz (Nat. Tijd. N.I. 27, 1864, 167) from clear streams in the Menumbung Hills, Banka Island" and expresses doubt about the record "firstly because Kurz's material was sterile and has not been traced in the herbarium and secondly because all specimens of *Callitriche* hitherto found in the Malaysian tropics occur at much higher altitudes." Banka Island lies off the east coast of southern Sumatra and between the two locations from which herbarium specimens of *C. palustris* var. *strumosa* have been seen. *Callitriche*

palustris var. *strumosa* is the only *Callitriche* recorded from low altitudes in the tropics, apart from obligate terrestrial species such as *C. peploides*. It seems possible that the records discussed by Backer (1954) refer to this taxon.

Paratype. [MALAYSIA.] Sabah, [Manukan?] Island, 4. *J. G. Kostermans s.n.* (L).

5. Callitriche raveniana Lansdown, sp. nov. TYPE: [Taiwan.] Taipei Hsien, Kueishan, Pei-Shih-Hsi, border of rocky river bed, 100 m, 16 Apr. 1991, *C.-I. Peng 13917* (holotype, HAST). Figure 1H.

Ab aliis *Callitriches* speciebus terrestrialibus Asiae bracteis minutis praesentibus differt.

Plants terrestrial. Leaves expanded, ± spathulate, blade 2–2.5 × 0.5–0.8 mm, petiole 1.3–1.5 mm; venation simple, usually limited to one primary and a pair of secondary veins with occasionally a few branches arising from secondary veins. Generally one carpellate and one staminate flower in each axil, occasionally only one solitary carpellate flower; bracts persistent, 0.2–0.3 mm. Filaments 0.2–0.3 mm; anthers very reduced, 0.2 × 0.2 mm; pollen spherical to ellipsoid, yellow, 20 × 18–20 µm; styles 0.2–0.3 mm. Fruits wider than high, 0.6–0.9 × 0.8–1.3 mm; subsessile to shortly pedunculate; winged throughout, wider at the apex, 0.07–0.1 mm wide at apex, 0.05–0.08 mm wide at side.

Callitriche raveniana differs from other terrestrial species of *Callitriche* in Asia by the presence of minute bracts.

Distribution and habitat. Both specimens of *C. raveniana* were collected from broad-leaved forest in Taiwan; one collection from a stream bed and the other from roadside.

Etymology. Named in honor of Dr. Peter H. Raven, President of the Missouri Botanical Garden.

This description is based on two specimens, both from Taiwan.

Paratype. CHINA. **Taiwan:** Taipei Co., Wulai Hsiang, Hsiaoyi, Tunghou stream, *S.-c. Liu, C.-h. Chen 251* (HAST, TNU).

6. Callitriche wightiana Wallich in Wight & Arnott 1834, Prodr. Fl. Ind. Orient: 339. 1834. TYPE: India. "Neelgherries" [Nilgiri Hills] s.d., *R. Wight 7008* (lectotype, designated here, K [Hb. Wallich], isotypes, CGE, E, K). Figure 1J.

Plants terrestrial or in shallow water. Leaves expanded, venation very complex, with many subsidiary veins arising from primary vein, within secondary veins and either anastomosing, rejoining secondary vein or splitting into many minor, much-branched veins, many veins also arise on outside of secondary veins and either rejoin this or anastomose. Flowers solitary, most frequently a pair of axils with a carpellate flower opposed by a staminate flower; bracts lacking. Filaments ± erect, less than 2.5 mm; anthers higher than wide, 0.1 × 0.4 mm; pollen yellow, strongly ornamented, 20 × 18–20 µm; styles erect or slightly spreading, less than 2 mm. Fruits distinctly wider than high, 1.8–2.3 × 1.4–2 mm; very broadly winged all round, wing very poorly differentiated in dried material, 0.3–0.4 mm wide at apex and sides.

Callitriche wightiana differs from all other *Callitriche* in the region by the fruits broadly winged all around, very complex venation, and lack of bracts. Although superficially similar to *C. fehmedianii*, herbarium material of *C. wightiana* can be separated by the uniform appearance of the fruits, whereas those of *C. fehmedianii* show a clear distinction between the wing and the main body of the mericarp. It also appears likely that *C. wightiana* grows mainly as a terrestrial plant in damp, forested habitats or in shallow water, whereas *C. fehmedianii* often grows in relatively deep water.

The protologue cites the type as "Wall.! L. under n. 7008; Wight! cat. n. 1095. *C. verna* var. *vulgaris*, Wall.! L. n. 7008 - Neelgherries." There is a specimen in the Wallich Herbarium in K that is undoubtedly the material on which the name is based and is designated here as the lectotype. From notes made on the various sheets, it appears that this is a part of a specimen labeled "Nilghirry Hills (Neelgherries), [undated] Wall. L. 7008 - W.C. 1095 *Callitriche wightiana*" in K and apparently the same as material labeled "Herb. Wight. propr. n. 1095, *Callitriche wightiana* Wall. L.n. 7008, Neelgherries, Peninsula Ind. orientalis" in E.

Distribution and habitat. Callitriche wightiana appears to have a limited distribution, with records from Sri Lanka and from Tamil Nadu in southeast India. It appears to occur mainly among mosses or in small pools in woodland.

Additional specimens examined. INDIA. **Tamil Nadu [Madras]:** Kodaikanal Dist., Berijam, Dindigul, *K. M. Mathew & M. Charles RHT 46005* (K). SRI LANKA. Sin coll. *3636* (BM, CGE, P); Central Prov., Nuwara Eliya Dist., Horton Plains, Farr Inn, *V. Balakrishnan MBK 121* (K, MO); Dieter's Plot P24, N Entrance, Horton Plains, *F. R. Fosberg & D. Mueller-Dombois 50039* (K, MO); Nuwara-eliya Dist., Hakgala Bot. Garden, *A. H. M. Jayasuriya & D. S. A. Wijesundara 3361* (MO).

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Literature Cited

Aston, H. I. 1973. Aquatic Plants of Australia. Melbourne Univ.

Backer, C. A. 1954. Callitrichaceae. Pp. 251–252 *in* C. G. G. van Steenis (editor), Flora Malesiana. Noordhoff-Kolff N.V., Jakarta.

Cheng, M. & T.-L. Ming. 1980. Flora Reipublicae Popularis Sinicae 45: 11–13. Science Press, Beijing.

Cook, C. D. K. 1996. Aquatic and Wetland Plants of India: A Reference Book and Identification Manual for the Vascular Plants Found in Permanent or Seasonal Fresh Water in the Subcontinent of India South of the Himalayas. Oxford Univ. Press, Oxford.

Fassett, N. C. 1951. *Callitriche* in the New World. Rhodora 53: 137–155; 161–182.

Kak, A. M. & G. N. Javeid. 1982. A revision of the genus *Callitriche* L. in the north western Himalayas. J. Bombay Nat. Hist. Soc. 79: 167–172.

Lansdown, R. V. 2006. Notes on the water-starworts (*Callitriche*) recorded in Europe. Watsonia 26: 105–120.

———. In press. Water-starworts (*Callitriche*) of Europe. B.S.B.I Handbook No. 11. B.S.B.I., London.

——— & C. E. Jarvis. 2004. Linnaean names in *Callitriche* L. (Callitrichaceae) and their typification. Taxon 53: 169–172.

Larsen, K. 2000. Callitrichaceae. *In* T. Santisuk & K. Larsen (editors), Flora of Thailand. Vol. 7: 251–252.

Merrill, E. D. & L. M. Perry. 1941. Plantae Papuanae Archboldianae VI. J. Arnold Arbor. 22: 253–270.

Sarwar, G. R. 1998. Callitrichaceae. *In* S. I. Ali & M. Qaiser (editors), Flora of Pakistan. No. 201. Dept. Bot. Univ., Karachi.

Schotsman, H. D. 1985. Une nouvelle espèce de *Callitriche* (Callitrichaceae) de Papoua-Nouvelle-Guinée: *Callitriche cycloptera* Schotsm. Bull. Mus. Natl. Hist. Nat., B. Adansonia 7: 115–121.

Shishkin, B. K. (editor). 1974, Flora of the U.S.S.R. Volume XIV. Geranialies, Sapindales, Rhamnales. Israel program for Scientific Translations, Jerusalem.

Yamazaki, T. 1993. Callitrichaceae: 323. *In* K. Iwatsuki, T. Yamazaki, D. E. Boufford & H. Ohba (editors), Flora of Japan. Vol. IIIa. Angiospermae Dicotyledoneae Sympetalae, Kodansha, Tokyo.

New Combinations in Actinidiaceae from China

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Abstract. During the revision of Actinidiaceae for the *Flora of China*, two new combinations are proposed, *Actinidia fulvicoma* var. *cinerascens* (C. F. Liang) J. Q. Li & D. D. Soejarto and *Saurauia polyneura* var. *paucinervis* (C. F. Liang & Y. S. Wang) J. Q. Li & D. D. Soejarto.

Key words: *Actinidia*, China, Guangxi, *Saurauia*, Xizang.

In the first comprehensive revision of *Actinidia* Lindley, Dunn recognized 21 species in four sections, i.e., sections *Impulliferae* Dunn, *Leiocarpae* Dunn, *Maculatae* Dunn, and *Vestitae* Dunn (Dunn, 1911). Later, H. L. Li's revision (1952) presented 36 species, transferred *Ampulliferae* into *Leiocarpae*, and divided *Vestitae* into *Strigosae* Li and *Stellatae* Li. H. L. Li later alleged that *Actinidia* consisted of 25 species without providing a detailed treatment (Li, 1976). Liang adopted H. L. Li's scheme (1952) and recognized 51 species in China (Liang, 1984). More recently, Huang et al. (2000) proposed that there were 62 species of *Actinidia* in China.

This increasing species number for *Actinidia* has confused the taxonomy, and its highly variable and diverse vegetative and reproductive characters are mainly responsible. The taxonomy of the genus needs further revision based on extensive examination of specimens and careful observation in the herbarium and field. We examined the specimens in the herbaria of the Institute of Botany, the Chinese Academy of Sciences (PE) and the Guangxi Institute of Botany, Guangxi Zhuangzu Autonomous and the Chinese Academy of Sciences (IBK). We herein recognize ca. 48 species of the genus *Actinidia* for the forthcoming treatment for the *Flora of China* project.

The taxonomy of *Saurauia* Willdenow is much less confusing than that of *Actinidia*, although the trichome and other characters exhibit considerable variation; we recognize 13 species from China.

1. Actinidia fulvicoma Hance, J. Bot. 23: 321. 1885. TYPE: China. Guangdong: Luo-Fu-Shan, May 1883, *B. C. Henry s.n.* (holotype, K).

1a. Actinidia fulvicoma var. **cinerascens** (C. F. Liang) J. Q. Li & D. D. Soejarto, comb. nov. Basionym: *Actinidia cinerascens* C. F. Liang, Fl. Reipubl. Popularis Sin. 19(2): 252–254, 320–321. 1984. TYPE: China. Guangdong: Luofu Shan, 27 July 1930, *Y. Q. Chen 41208* (holotype, IBK).

Taxa attributed to *Actinidia cinerascens* have very similar fruit and inflorescences to *A. fulvicoma*. They share densely tomentose cymes with white flowers and cylindric-ovoid fruits. The petals are obovate to narrowly obovate, the length of the petals of *A. cinerascens* is 6–7 mm, and that of *A. fulvicoma* is 6–17 mm; the fruits of both are 1.5–2 cm long with persistent reflexed sepals (Liang, 1984). *Actinidia fulvicoma* is densely tomentose on branchlets and densely stellate-tomentose on the leaves abaxially. Occasionally, specimens of *A. fulvicoma* may be rusty-velutinous on the branchlets or sparsely stellate-tomentose on the leaves abaxially, indicating that there is no clear-cut distinction between the characters of the trichomes of *A. fulvicoma* and *A. cinerascens*. The trichomes of *Actinidia* are highly variable, and taking into account other overlapping of characters, *A. cinerascens* is reduced to a variety of *A. fulvicoma*.

Actinidia fulvicoma var. *cinerascens* differs from other taxa of this species in that it is usually brownish

velutinous on branchlets and petioles and partly thinly tomentose on the abaxial surface of the leaves, while other taxa are usually tomentose or hirsute on branchlets and petioles and densely tomentose on the abaxial surface of the leaves.

Distribution. Low mountain forests from Guangdong to Hunan at 300–1000 m.

Representative specimens examined. CHINA. **Guangdong:** Lianping, *Z. F. Wei 120091* (IBK, PE); Huiyang, *Z. F. Wei 121600* (PE); Luofushan, *N. Q. Chen 41085* (PE); Wuhua, *X. G. Li 201603* (IBK). **Hunnan:** Chengbu, *T. R. Cao 43* (IBK).

2. Saurauia polyneura C. F. Liang & Y. S. Wang, Fl. Reipubl. Popularis Sin. 49(2): 333. 1984. TYPE: China. Yunnan: Nujiang Valley, *T. T. Yii 19211* (holotype, PE).

2a. Saurauia polyneura var. **paucinervis** (C. F. Liang & Y. S. Wang) J. Q. Li & D. D. Soejarto, comb. nov. Basionym: *Saurauia paucinerris* C. F. Liang & Y. S. Wang, Fl. Reipubl. Popularis Sin. 49(2): 299, 333–334. 1984. TYPE: China. Xizang: Chayu, *Qinghai-Xizang Exp. 642* (holotype, PE).

In Liang's (1984) key, he differentiated *Saurauia polyneura* from *S. paucinervis* only by the number of lateral veins of the leaves: the former has 35 to 40 pairs, while the latter has 15 to 20 pairs. Upon close examination, the number of pairs of lateral veins on mature leaves is variable and ranges from about 22 to 40 in these two taxa. This is somewhat but not tightly correlated with the leaf shape, which is narrowly obovate-lanceolate to narrowly oblong, often with cuneate base in *S. polyneura* and obovate-elliptic or narrowly obovate-elliptic to elliptic or narrowly elliptic, with obtuse base in *S. paucinervis*. Herein, we relegate *S. paucinervis* to a variety of *S. polyneura*.

Distribution. Forests, valleys in SE Xizang at 1600–2200 m.

Representative specimens examined (all at PE). CHINA. **Xizang:** Chayu, *B. S. Li 6941, Z. C. Ni 371, 443, Qinghai-Xizang Exp. 1483*; Motuo, *S. Z. Cheng 233, 3052, 1602, 4737, 2270.*

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Literature Cited

Dunn, S. T. 1911. A revision of the genus *Actinidia* Lindl. J. Linn. Soc., Bot. 39: 394–410.

Huang, H. W., J. J. Gong, S. M. Wang, Z. C. He, Z. H. Zhang & J. Q. Li. 2000. Genetic diversity in the genus *Actinidia*. Chin. Biodivers. 8: 1–12.

Li, H. L. 1952. A taxonomic review of the genus *Actinidia*. J. Arnold Arbor. 33: 1–61.

———. 1976. Actinidiaceae. Pp. 585–591 *in* H. L. Li, T. S. Liu, T. C. Huang, T. Koyama & C. E. DeVol (editors), Flora of Taiwan. Vol. 2. Epoch Publishing, Taipei.

Liang, C. F. 1984. Actinidiaceae. Pp. 195–302 *in* K. M. Feng (editor), Flora Reipublicae Popularis Sinicae. Vol. 49(2). Science Press, Beijing.

Two New Species of *Carex* sect. *Racemosae* (Cyperaceae) from China

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Abstract. Two new species, *Carex bijiangensis* S. Y. Liang & S. R. Zhang and *C. obliquitruncata* Y. C. Tang & S. Y. Liang, are described and illustrated. Both species are found in China and belong to *Carex* sect. *Racemosae* G. Don by having typically female lateral spikes, a gynecandrous terminal spike, dark female glumes, and three stigmas.

Key words: *Carex*, China, Cyperaceae.

In preparing the taxonomic treatment of Cyperaceae for *Flora of China*, the authors found two new species of *Carex* from southwestern China. Based on their female (or occasionally gynecandrous) lateral spikes, a gynecandrous terminal spike, dark female glumes, and three stigmas, both new species belong to section *Racemosae* G. Don (1830), which is a large section within *Carex*, with about 60 species in extratropical areas of Eurasia and North America (Egorova, 1999). There are about 21 species of the section in China, mainly occurring in northeastern, northwestern, and southwestern China (Liang, 2000). Section *Atratae* (Heuffel) H. Christ (1885) may be the more familiar sectional name in *Carex*, but section *Racemosae* G. Don is an earlier valid name for the section as determined by Reznicek (2001).

1. Carex bijiangensis S. Y. Liang & S. R. Zhang, sp. nov. TYPE: China. Yunnan: Mt. Biluo Shan, Bijiang, 4000 m, 18 Aug. 1934, *H. T. Tsai 58022* (holotype, PE). Figure 1.

Haec species *C. kansuensi* Nelmes et *C. gmelinii* Hooker et Arnott affinis, sed utriculis anguste ellipticis, membranaceis, aveniis, ore rostri truncato vel emarginato differt.

Rhizome short; culms tufted, 50–60 cm high, ca. 2.5–3.5 mm wide, triquetrous, with purplish brown, leafless and sometimes fibrillose sheaths at base. Leaves shorter than culms, 4–7 mm wide, flat. Inflorescence racemose, with 4 to 6 spikes; bracts without sheaths, lowest 1 or 2 leaf-like, exceeding inflorescence, upper ones bristle-like, shorter than inflorescence; upper spikes congested, lowest 1 or 2 remote; the terminal spike gynecandrous, cylindrical, 2.5–3.5 × ca. 1 cm, the lateral ones female, occasionally gynecandrous, oblong or cylindrical, 2 × ca. 0.8–0.9 cm, the lowest spike with a peduncle 8–12 mm long, upper ones with shorter or sessile peduncles. Female glumes ovate-lanceolate, 6–6.5 × 2 mm, with long scabrous awns 1–1.5 mm long, membranous, dark brown, 1-nerved; utricles shorter than glumes, narrowly elliptic, 4–5 mm long, veinless, membranous to almost coriaceous, yellowish green to dark purple, apices attenuate into short beaks ca. 0.2 mm long, beak mouths purple-black, truncate or emarginate; stigmas 3. Nutlets narrowly obovate, trigonous, yellow, 2.5 mm long.

Distribution and habitat. The new species is found in southeastern Xizang (Tibet) and northwestern Yunnan, China, and has been collected from mountain slopes, shrub- and grasslands, alpine meadows, and ditch sides, from elevations 3100–4300 m.

Phenology. Flowering and fruiting from July to September.

Etymology. The epithet is based on "Bijiang," a county from Yunnan, China, where the holotype of the species was collected.

Affinities. *Carex bijiangensis* is associated with those *Carex* that possess robust culms and larger glumes and utricles within section *Racemosae*, and is similar to *C. kansuensis* and *C. gmelinii* by having stout culms (2.5–4 mm wide), larger acute or awned glumes (6–6.5 mm long), and larger utricles (4–5 mm long). The differences among these three species are listed in Table 1.

Paratypes. CHINA. **Xizang:** Ridong, Zayu, *Qinghai-Xizang Exped. 10238* (PE); Cawalong, Zayu, *C. W. Wang 65963a* (PE). **Yunnan:** Bijiang, *H. T. Tsai 54125* (PE), *H. T. Tsai 58093* (PE); Cizhong, Deqen, *K. M Feng 5306* (PE); Pika, Zhongdian, *T. T. Yu 11921* (PE).

2. Carex obliquitruncata Y. C. Tang & S. Y. Liang, sp. nov. TYPE: China. Yunnan: Gongshan, grassy slopes, 4000 m, 30 Sep. 1938, *T. T. Yü 22740* (holotype, PE). Figure 2.

Species *C. schneideri* Nelmes similis, sed culmis 25–50 cm altis, bractea ima sterili, utriculis atropurpureis, enervibus, oribus oblique-truncatis, nuculis minoribus, ca. 1.5 mm longis, ovatis differt.

Figure 1. *Carex bijiangensis* S. Y. Liang & S. R. Zhang. —A. Plant. —B. Female glume. —C. Utricle. —D. Nutlet. Drawn from the holotype, *Tsai 58022* (PE).

Rhizome short; culms tufted, 25–50 cm high, 1–2.5 mm wide, triquetrous, upper part scabrid, with purple or dark brown, leafless and fibrillose sheaths at base. Leaves shorter than culms, 2–3.5 mm wide, flat, acuminate. Inflorescence racemose; lowest bract leaf-like, sterile, ca. 5–10 × 0.2 cm, exceeding the inflorescence, without sheath, upper fertile bracts bristle-like; spikes 3 or 4, congested or the lowest one remote; terminal spike gynecandrous, 1.5–2.5 cm long; lateral ones female, or occasionally with a few

Figure 2. *Carex obliquitruncata* Y. C. Tang & S. Y. Liang. —A. Plant. —B. Female glume. —C. Utricle (abaxial view). —D. Utricle (lateral view). —E. Nutlet. Drawn from the holotype, *Yü 22710* (PE).

male flowers at base, oblong or cylindrical, 1.5–2.5 × ca. 0.8 cm, purplish brown; upper spikes nearly sessile, the lowest one with a peduncle 2–5 mm long. Female glumes narrowly lanceolate, 3.5–4 × 1 mm, dark purple, 1-nerved; utricles narrowly oblong or narrowly elliptic, 3.2–4 mm long, membranous, yellowish green to dark purple, veinless or with 3 to 5 short veins, base contracted and shortly stiped, apices

Table 1. Morphological comparison of *Carex bijiangensis*, *C. gmelinii*, and *C. kansuensis*.

Characters	*C. bijiangensis*	*C. gmelinii*	*C. kansuensis*
Distribution	SW China (SE Xizang and NW Yunnan)	Russian Far East, NE China, Japan, NW North America	NW to SW China (Gansu, Shaanxi, W Sichuan, E Xizang, and NW Yunnan)
Glumes	6–6.5 mm, long awned	ca. 4–5 mm, long awned	4–4.5 mm, not awned
Utricles	4–5 mm, narrowly elliptic, veinless	4–5 mm, broadly elliptic to elliptic, veined	ca. 4–4.5 mm, broadly oblong, veinless
Utricle beaks	truncate or emarginate	emarginate	minutely bidentate
Nutlets	2.5 mm, narrowly obovate, trigonous, not compressed	ca. 2 mm, obovate, trigonous, slightly compressed	ca. 2 mm, oblong, trigonous, not compressed

Table 2. Morphological comparison of *Carex obliquitruncata* and *C. schneideri*.

Characters	*C. obliquitruncata*	*C. schneideri*
Culms	25–50 cm	60–90 cm
Utricles	yellowish green to dark purple, veinless or with 3 to 5 short veins, apices acuminate and not forming beaks, mouth of utricle obliquely truncate	yellowish green, veined, apices rounded to blunt, shortly beaked, with beaks 0.1–0.2 mm, mouth of beak emarginate
Nutlets	ca. 1.5 mm, obovate	2 mm, oblong

attenuate, acuminate, not forming beaks, utricle mouths obliquely truncate; stigmas 3. Nutlets included in the lower part of utricle, ovate, trigonous, tiny, ca. 1.5 mm long, castaneous, sessile.

Distribution and habitat. The new species was collected from northwestern Yunnan, China, from grassy slopes, grasslands, and pond sides, from elevations 3000–4000 m.

Phenology. Flowering and fruiting from August to October.

Etymology. The species is named "obliquitruncata" due to the shape of the summit of the utricle.

Affinities. The new species is unique in *Carex* sect. *Racemosae* in bearing an obvious sterile bract below the inflorescence and the summit of the utricle being obliquely truncate. Nevertheless, it is assigned to section *Racemosae* based on its female lateral spikes, a gynecandrous terminal spike, and dark female glumes. The species is similar to and sympatric with *C. schneideri*. They differ from each other by several morphological characters, which are listed in Table 2.

Paratypes. CHINA. **Yunnan:** Mt. Biluo Shan, Bijiang, *H. T. Tsai 58237* (PE); Changputong, Gongshan, *K. M. Feng 7863* (PE); Sijitong, Gongshan, *C. W. Wang 67289* (PE).

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Literature Cited

Christ, H. 1885. Nouveau Catalogue des *Carex* d'Europe. Bull. Soc. Roy. Bot. Belgique 24: 10–20.

Don, G. 1830. *Carex*. Pp. 367–377 *in* J. C. Loudon (editor), Hortus Brittanicus. Longman, Rees, Orme, Brown & Green, London.

Egorova, T. V. 1999. The Sedges (*Carex* L.) of Russia and Adjacent States (within the limits of the former USSR). St.-Petersburg State Chemical-Pharmaceutical Academy, St.-Petersburg, and Missouri Botanical Garden Press, St. Louis.

Liang, S. Y. 2000. *Carex* section *Atratae*. Pp. 99–118 *in* L. K. Dai & S. Y. Liang (editors), Flora Reipublicae Popularis Sinicae, Vol. 12. Science Press, Beijijng.

Reznicek, A. A. 2001. Sectional names in *Carex* (Cyperaceae) for the Flora of North America. Novon 11: 454–459.

Calciphila, a New Genus in African Asclepiadeae (Apocynaceae, Asclepiadoideae), and Taxonomic Rectifications in *Cynanchum*

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Abstract. During work for the *Flora of Somalia* account of Apocynaceae subfamily Asclepiadoideae, a new species of uncertain affinity was discovered. DNA analysis revealed that the new species, *Calciphila gillettii* Liede & Meve, is most closely related to the recently described *Cynanchum galgalense* Liede, which was only provisionally included in *Cynanchum* L. after DNA analysis. As the best taxonomic solution for the two species not fitting into any of the known genera of milkweeds, the description of a new genus, *Calciphila* Liede & Meve, is proposed. Also, in the course of work for the *Flora of Somalia*, it was realized that *Cynanchum clavidens* N. E. Brown needs to be renamed *Cynanchum hastifolium* K. Schumann if the two taxa are considered to constitute subspecies of the same species, because *C. clavidens* has previously been put into synonymy with *C. hastifolium*. Finally, work on the *Flore des Seychelles* brought to light that *Cynanchum robertsoniae* Liede is identical with the Indian *C. callialatum* Buchanan-Hamilton ex Wight, and needs to be placed in synonymy with the latter. A lectotype is designated for *C. callialatum*.

Key words: Africa, Asclepiadeae, *Calciphila*, Cynanchinae, *Cynanchum*, Seychelles, Somalia.

During work on the *Flora of Somalia* treatment of Apocynaceae subfamily Asclepiadoideae, a specimen from the Botanical Museum of Uppsala University (UPS) could not be placed into any of the milkweed taxa known from there. While the small, leafless shrublet itself was sterile, a photograph clearly showing a *Cynanchum viminale* L. flower was attached, suggesting that the specimen constitutes a new taxon in the variable *C. viminale* group. However, closer examination revealed that the photograph could not have been taken from the plant on the specimen, because the size of the succulent shoot and its coloration did not match between specimen and picture. The plant itself was described on the label (*Thulin et al. 10122*, UPS) as having clear latex, a character so far unknown for the *C. viminale* group. On a second specimen obtained from the Kew Herbarium (K), luckily a few flowers were found. Size and structure of the extremely small flowers, together with the clear latex, led to the inference that the plant might be possibly related to the *Blyttia* Arnott–*Diplostigma* K. Schumann–*Goydera* Liede complex in the Tylophorinae, whose members possess clear latex and very small flowers with a variable corona, and are well known from Somalia. We then obtained permission to sequence DNA from the UPS specimen in order to clarify the position of the taxon. It soon became clear that the plant is the closest known relative to *Cynanchum galgalense* Liede, which had been left in *Cynanchum* L. for its corona morphology even though molecular results did not support that position (Liede & Kunze, 2002); indeed the position of the two species in the Asclepiadeae is still puzzling.

Material and Methods

From the specimen *Thulin et al. 10122* (UPS), we managed to obtain DNA sequences of the regions commonly used in our lab for phylogenetic reconstructions, namely, ITS (nrDNA) and the *trn*T-L, *trn*L-F spacer and the *trn*L intron (cpDNA). In order to learn about the position of the specimen, two routes were followed. First, the sequences were inserted in recently published alignments of Asclepiadoideae (Astephaninae, Liede, 2001; *Cynanchum*, Liede & Täuber, 2002; African *Cynanchum*, Liede & Kunze, 2002; Tylophorinae, Liede et al., 2002). The datasets are available from the authors upon request. Second, a basic local alignment search tool (BLAST) search (Altshul et al., 1997) was conducted for each of the four partial sequences (Table 1).

Results

The results of both approaches (cf. Material and Methods) show clearly that not only the morphological characters of the new species, but also its DNA characters constitute a mosaic between various taxa known from the area (Table 1). While there is little doubt that the closest relative to the new species is *Cynanchum galgalense*, another endemic from calcareous regions in Somalia, the position of the two species is less clear. Depending on the dataset, the two species are placed (1) on a polytomy comprising

Table 1. Results of the BLAST analysis of the four partial sequences of *Calciphila gillettii*.

	Name of the taxon with the most similar sequence (voucher)	Accession number of the most similar sequence	Score (bits)/ % identity	Notes
ITS	*Cynanchum ellipticum* (Harvey) R. A. Dyer (*Liede 2933*, UBT)	AJ320444	646/94%	Positions 2–4 taken by other African *Cynanchum* species (score 638 bits/94% identity), *C. galgalense* (*Thulin & Warfa 6205*) only on position 5 (630/94%), again followed by two African *Cynanchum* species (624 & 622, respectively/93%) and *Schizostephanus alatus* (615/93%).
*trn*T-L intergenic spacer	*C. galgalense* (*Thulin, Dahir & Osman 9433*, UPS)	AJ492340	511/73%	Positions 2–21 (504–490/73%–72%) taken by Tylophorinae (e.g., *Tylophora heterophylla* A. Richard); the second specimen of *C. galgalense* (*Thulin & Warfa 6205*, K, UPS) ranges 22nd (490/72%).
*trn*L intron	*C. galgalense* (*Thulin, Dahir & Osman 9433*, UPS)	AJ492340	969/98%	Position 2 taken by the 2nd specimen of *C. galgalense* (*Thulin & Warfa 6205*, UPS) (954/98%), followed by several Metastelmatinae (e.g., *Metastelma schaffneri* A. Gray) and Tylophorinae (e.g., *Tylophora tenuis* Blume) species (906–888/96%).
*trn*L-F intergenic spacer	*C. galgalense* (*Thulin, Dahir & Osman 9433*, UPS)	AJ492342	692/98%	Position 2 taken by the 2nd specimen *C. galgalense* (*Thulin & Warfa 6205*, UPS: 658/96%), followed by *Schizostephanus alatus* (646/96%), and 16 Madagascan *Cynanchum* spp. (642/98%).

Oxystelma R. Brown (occurring together with *Solenostemma* Hayne), Tylophorinae, and Asclepiadinae (cpDNA datasets: Liede, 2001; Liede & Täuber, 2002), (2) in an association with *Schizostephanus* Hochstetter ex K. Schumann (Cynanchinae: cpDNA dataset combined with ITS; Liede & Kunze, 2002), or (3) in a sister-group position to the Tylophorinae (cpDNA dataset combined with ITS: Liede et al., 2002). As ITS sequences between Cynanchinae, Tylophorinae, and Asclepiadinae are so different that unambiguous alignments are impossible, no ITS alignment comprising members of all subtribes has been created.

Taking the isolated position of the new taxon and the character mosaic of the two sister species into account, it is considered taxonomically practical to distinguish the two species from *Cynanchum* L. as the new genus *Calciphila* Liede & Meve.

Calciphila Liede & Meve, gen. nov. TYPE: *Calciphila galgalensis* (Liede) Liede & *Meve*.

Plantae foliis carnosulis inferioribus caducis; latice pellucido; coronis gynostegialibus cyathiformibus vel urceolatis, partibus staminalibus interstaminalibusque late connatis, sulcatis; gynostegiis pyramidalibus; seminibus tuberculatis.

Pubescent, twiners or shrublets with small, fleshy caducous leaves; latex clear. Flowers very small, to 1.5 × 1 mm, rotate with corolla lobes ± erect to produce a cyathiform structure; gynostegial corona urceolate to cyathiform, consisting of staminal and interstaminal parts fused for at least 3/4 of total corona length, sulcate, emarginate; gynostegium pyramidal with oblique guide rails along the whole length of anthers, connective appendages triangular; pollinia pendulous, oblongoid; style head umbonate to tabular. Follicles thin-walled, fusiform; seeds tuberculate.

Distribution. Two species endemic to Somalia.

The new genus exhibits a unique mosaic of characters. Some characters, in particular a highly fused corona overtopping the gynostegium and the corolla lobes either glabrous or equally covered with verrucose trichomes, are also typical of *Cynanchum*. Other characters, in particular the clear latex and the fleshy caducous leaves, are very similar to some Tylophorinae genera, in particular *Goydera*, *Blyttia*, and *Diplostigma*. Ecologically, the new genus is characterized by its preference for calcareous soils, to which the genus name refers. All plants recorded to date were found only on limestone.

Key to the Species of *Calciphila* in Somalia

1a. Erect shrublet with leaves to 2 mm long, shoots green; corolla purplish cream, glabrous; gynostegium stipitate, corona cyathiform. . . . . *C. gillettii*, new species

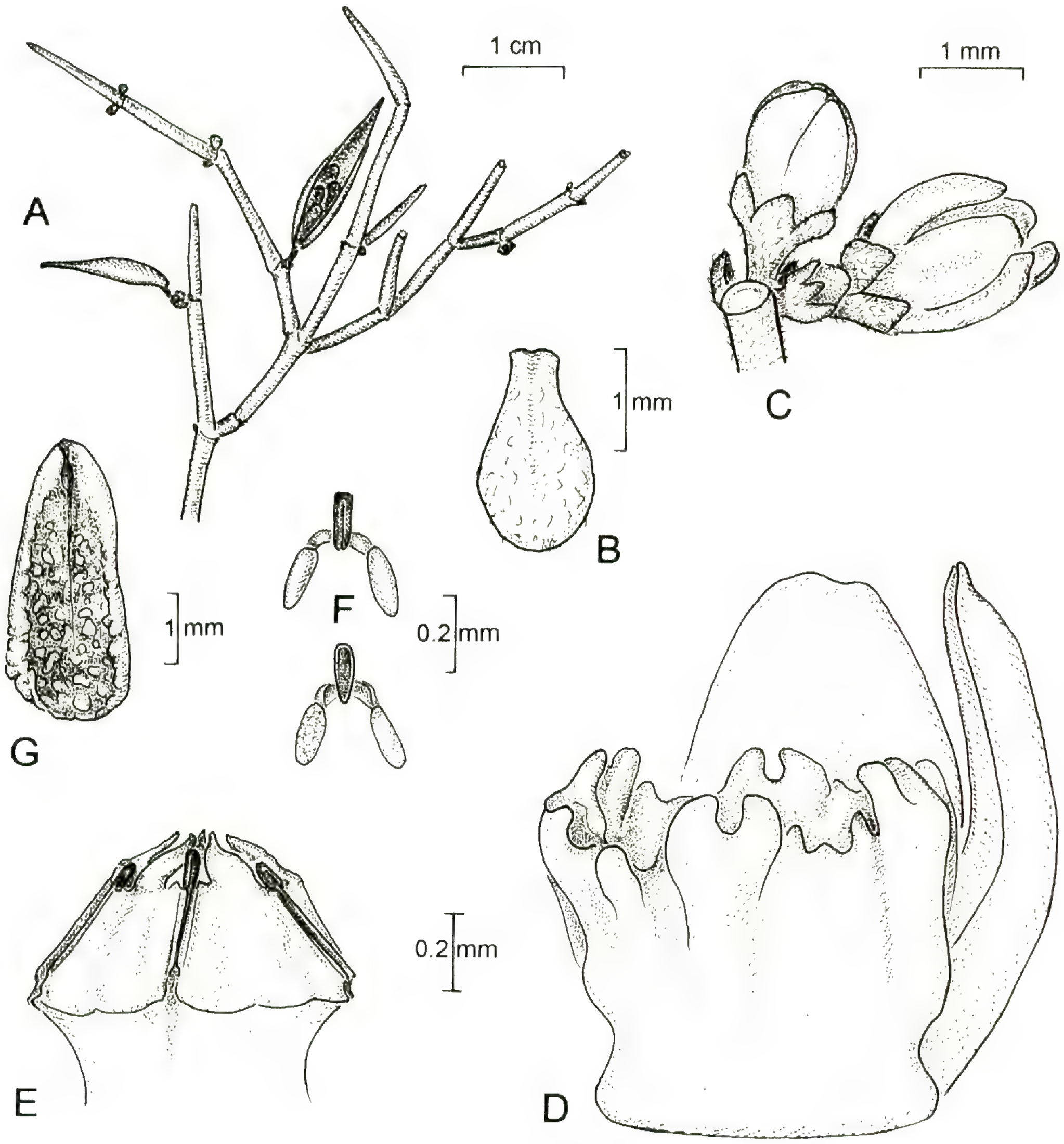

Figure 1. *Caleiphila gillettii* Liede & Meve. —A. Fruiting branch. —B. Leaf. —C. Inflorescence. —D. Flower (corona in lateral view, calyx and parts of the corolla removed). —E. Gynostegium. —F. Pollinarium (top: frontal view; bottom: back view). —G. Seed (seta side). A & G from *Thulin et al. 10122* (UPS); B–F from *Gillett & Watson 23805* (K). All drawn by U. Meve.

1b. Climber with leaves 4–14 mm long, shoots yellowish to brownish; corolla cream-colored, with verrucose trichomes; gynostegium sessile, corona urceolate . . . . . *C. galgalensis*

1. **Caleiphila gillettii** Liede & Meve, sp. nov. TYPE: Somalia. Bari: rocky hill, 7 July 1981, *J. B. Gillett & R. M. Watson 23805* (holotype, K). Figure 1.

Fruticuli nani, ramosissimi; caulibus virgatis, non volubilibus; foliis obovatis, succulentis, 1.5–2 mm longis, mox siccescentibus; corollis purpureis, glabris; coronis gynostegialibus cyathiformibus; gynostegiis stipitatis. Differt a *Cynancho* speciebus caulibus viridibus, latice hyalino, a Tylophorinarum speciebus coronis late connatis.

Erect virgate shrublets, 5–40 cm high, richly branched; shoots perennial, woody to herbaceous, green, densely covered with recurved trichomes, 80 µm long; *internodes* 1–2.5 × 0.15–0.3 cm; *latex* colorless; *stipule-like short shoots* absent. *Leaves* caducous, absent at the time of flowering, sessile, blades fleshy, 1.5–2 × 1 mm, obovate, apically obtuse, marginally straight and thickened, adaxially and abaxially sparsely pubescent with recurved trichomes, 50–100 µm long; colleters absent. *Inflorescences* always one per node, extra-axillary, 3- to 10-flowered, 2 to 5 flowers open synchronously, sciadioidal, sessile; *floral bracts* 0.5 × 0.3 mm, deltoid, with abaxial trichomes; *pedicels* 0.5 mm long,

densely pubescent with recurved trichomes, 100 µm long. *Floral buds* 1.5 × 1 mm, globose to ovoid, with imbricate aestivation, dextrorse; *calyx* basally fused; with abaxial trichomes, lobes 0.4 × 0.3 mm, triangular-deltate; *corolla* 1.5 mm long, abaxially cream, adaxially purple, lobes basally fused, 0.7–0.8 mm wide, ascending to erect, oblong, apically obtuse; *gynostegial corona* cyathiform, white, glabrous, ca. 0.9–1 mm long, consisting of connate staminal and interstaminal parts, exceeding the gynostegium and partly obscuring it; tube reaching more than 3/4 of corona length, with a slight basal constriction; staminal parts producing a pronounced convex fold along the upper half of corona, slightly cucullate, apically bifid with rounded apices, longer than the rectangular, ± erect, emarginate interstaminal parts; *gynostegium* 0.9 × 1 mm, atop a stipe of 0.3 mm; *anthers* broader than long, trapezoidal, abaxially convex; anther wings 350 µm long, extending along whole length of anther, consisting of distal and proximal ridge; anther wings of adjacent anthers parallel to each other, in the same plane as the anther; connective appendages 150 × 120 µm wide, triangular, narrower than the stamen, strongly inflexed. *Pollinarium*: corpusculum 100 µm long, more than twice as long as broad, elliptic, margins of the corpuscular cleft parallel; caudicles 50 µm long, (sub-)basally inserted at the corpusculum, flattened, convexly recurved, rectangular; pollinia apically attached to the caudicles, 160–180 × 60 µm wide, elliptical in cross section, oblongoid; *style-head* white, 0.4 × 0.5 mm, upper part 0.1 mm high, shorter than the lower part, tabular. *Follicles* 1 per flower, erect to horizontal, 13–18 × 2.5 mm diam., fusiform, terete, apically short-beaked, greenish light brown, uniformly colored, smooth, with dense indumentum, with papery pericarp; seeds ca. 4 to 8 per follicle, ca. 4 × 1.8 mm, oblong, dark brown, tuberculate, papillose, marginally with 0.3 mm wing, multicellular in cross section, with enrolled margin; coma ca. 6 mm long, pure white.

Phenology. Flowering in July. Fruiting in January.

Distribution and habitat. Flat areas of limestone slopes, from 1300 and 1600 m, in Somalia. Often growing under larger shrubs; heavily grazed by goats.

Conservation status. Very localized, but common in its area (IUCN classification: EN B1a).

The insignificant habit of the new species, notable for its small, caducous leaves and tiny flowers to less than 1 mm diam., explains its long absence from the literature. Furthermore, the casual observer might easily mistake *Calciphila gillettii* for some species of *Asparagus* L., *Euphorbia* L., or *Cynanchum* (former *Sarcostemma* R. Brown), and the very localized distribution area adds further to its obscurity.

Paratype. SOMALIA. **Bari:** Al Miskat, N Dasan in Dal loád area, 1600 m, *Thulin, Abdi Dahir & Osman 10122* (K, UPS).

EMBL accession numbers of DNA sequences. ITS: AM229664; *trn*T-L intergenic spacer: AM229661; *trn*L intron: AM229662; *trn*L-F intergenic spacer: AM229663.

2. Calciphila galgalensis (Liede) Liede & Meve, comb. nov. Basionym: *Cynanchum galgalense* Liede, Ann. Missouri Bot. Gard. 83: 312. 1996b. TYPE: Somalia. Bari: Al Miskat Mts., ca. 15 km SW of Candala, Toh well, 2 Dec 1985, *Thulin 5612* (holotype, K; isotype, UPS).

Cynanchum hastifolium

Also in the course of the Asclepiadoideae treatment for *Flora of Somalia*, editor Mats Thulin (UPS) alerted us to the fact that Cufodontis (1960) gives a different nomenclatural history for the taxon described as *Cynanchum clavidens* N. E. Brown in Liede (1996b). Following the then most-recent edition of *Index Kewensis*, as well as Bullock's (1963) treatment of Asclepiadaceae for *Flora of West Tropical Africa*, Liede (1996b) attributed the name *C. hastifolium*—as well as *C. clavidens*—to N. E. Brown (1895). Cufodontis (1960), however, showed that *C. hastifolium* has to be attributed to K. Schumann (1895), who based it on a nomen nudum, *Cynoctonum hastifolium* Hochstetter ex Schweinfurth (1867), because the publication of Schumann (1895) took place in May and the one of N. E. Brown (1895) in October. Luckily, Cufodontis (1960) selected the type indicated by N. E. Brown (1895), *Schimper 1690*, to lectotypify *C. hastifolium* K. Schumann; however, he did so without explicitly stating that he (Cufdodontis, 1960) was carrying out a lectotypification. Cufodontis (1960) also realized the conspecifity of *Cynanchum hastifolium* and *C. clavidens* N. E. Brown. Liede (1996b) came to the conclusion that *C. clavidens* and *C. hastifolium* deserve subspecific recognition, but unaware of the difference in time pointed out by Cufodontis (1960), she selected *C. clavidens* as name for the species, maintaining *C. hastifolium* at subspecific level as *C. clavidens* subsp. *hastifolium* (N. E. Brown) Liede. However, *C. hastifolium* K. Schumann has priority over *C. hastifolium* N. E. Brown and *C. clavidens* N. E. Brown, and therefore, *C. hastifolium* subsp. *hastifolium* has to be the typical subspecies, and the new combination *C. hastifolium* subsp. *clavidens* becomes necessary.

Key to the Subspecies of *Cynanchum hastifolium* in Africa

1a. Style head well exceeding the corona, floral buds 6–6.5 mm long . . . . . *C. hastifolium* subsp. *clavidens*
1b. Style head not or hardly exceeding the corona; floral buds 3–4 mm long . . . . . *C. hastifolium* subsp. *hastifolium*

1a. Cynanchum hastifolium subsp. **hastifolium**

K. Schumann, in Engler & Prantl, Nat. Pflanzenfam. 4(2): 253. 1895. *Cynanchum hastifolium* N. E. Brown, Bull. Misc. Inform. Kew 106: 257. 1895. *Cynanchum clavidens* subsp. *hastifolium* (N. E. Brown) Liede, Ann. Missouri Bot. Gard. 83: 306. 1996b. TYPE: Ethiopia. Prope Djeladjeranne, 29 Aug. 1840, *W. G. Schimper 1690* (holotype, K; isotype, P).

The taxon has seen a number of invalid descriptions, all attributing the name to Hochstetter: *Cynoctonum hastifolium* Hochstetter ex Schweinfurth (1867: 128), nom. nud., *Vincetoxicum hastifolium* Hochstetter ex Oliver (1888: 320), nom. nud. The name *Cynanchum hastifolium* was also attributed to Hochstetter by Schumann (1895) as "*C. hastifolium* (Hochst.) K. Schum." Most likely, the taxon was intended for description by Hochstetter, as it can be deduced from the annotation of the type with a printed label, "*Cynoctonum hastifolium* Hochstetter," but the description was obviously never published.

1b. Cynanchum hastifolium subsp. **clavidens** (N. E. Brown) Liede, comb. et stat. nov. Basionym: *Cynanchum clavidens* N. E. Brown, Bull. Misc. Inform. Kew 106: 256. 1895; *Cynanchum flavidens* N. E. Brown, Index Kewensis Suppl. 1: 121. 1906, spelling error for *Cynanchum clavidens*. TYPE: Ethiopia. Ogaden: Boobi, 5 Feb. 1933, *F. L. James & J. G. Thrupp s.n.* (holotype, K).

Cynanchum callialatum

Lastly, in the course of studies for the *Flore des Seychelles*, Friedmann (1994) lists only one species of *Cynanchum* for the archipelago, a probably introduced Indian species, *C. callialatum* Buchanan-Hamilton ex Wight. Comparison of *C. robertsoniae* Liede, hitherto known only from the type, with this material and with Indian material, quickly revealed that *C. robertsoniae* is not, as the author thought, a rare relative of African *Cynanchum*, but a synonym of *C. callialatum*, for which a lectotype needs to be selected.

1. Cynanchum callialatum Buchanan-Hamilton ex Wight, Contr. Bot. India 56. 1834. *Cynoctonum callialatum* (Buchanan-Hamilton ex Wight) Decaisne, Prodr. 8: 528. 1844. *Vincetoxicum callialatum* (Buchanan-Hamilton ex Wight) Kuntze, Revis. Gen. Pl. 2: 424. 1891. *Cyathella callialata* (Buchanan-Hamilton ex Wight) C. Y. Wu & D. Z. Li, Acta Phytotax. Sin. 28(6): 465. 1990. TYPE: India, *N. Wallich, Herb. Asclep. 83a* (lectotype, designated here, K).

Cynanchum robertsoniae Liede, syn. nov. Kew Bull. 50: 805 808. 1995. TYPE: Seychelles, Mahé, 13 Oct. 1936, *C. Osborne-Day 201* (holotype, BM).

The transfer of a group of taxa, including *Cynanchum callialatum*, to *Cyathella* Decaisne by Li et al. (1990), mainly for phytochemical reasons, has found no support by later workers and is not followed here. While their (Li et al., 1990) decision to separate *Vincetoxicum* Wolf from *Cynanchum* is well documented by morphological, phytochemical, and molecular data (e.g., Liede, 1996a; Liede & Täuber, 2002), the species of *Cyathella* in recent molecular analyses form a well-defined group within the larger *Cynanchum* clade and might deserve subgeneric or sectional status (Liede & Täuber, 2002), but cannot be considered an independent genus.

Wight (1834: 56) lists three syntypes for *Cynanchum callialatum*, "*Herb. Ham. ! n.* 768; *Wall. ! Ascl. n.* 83; *Wight.! cat. n.* 1551." The first of these, *Herb. Ham. 768*, could not be traced, and its presumed existence in CAL could not be confirmed. The second one, *Wall. Ascl. n. 83* is extant in the Wallich Herbarium of the Royal Botanic Gardens, Kew. It consists of two sheets, with *83a* and *83b* penciled on them. Number *83a* is the better of the two, with one flowering shoot and one fruiting one. The label has "*Cynanchum callialata*" and "*Botanical Garden 8 January 1815*" written in ink, and "*ascl.83.a*" written in pencil. As *Wall. Ascl. n. 83a* represents an easily accessible, complete, and well-preserved specimen, it is selected as lectotype for *C. callialatum* here.

Acknowledgments. We thank Mats Thulin and David Goyder (K) for their help with specimen information. We thank the directors of K and UPS for the loan of specimens, and the director of UPS for the permission to extract DNA from a specimen. We also thank Pat Matyot, Island Conservation Society, Seychelles, for alerting us to Friedman (1994).

Literature Cited

Altschul, S. F., T. L. Madden, A. A. Schäffer, J. Zhang, Z. Zhang, W. Miller & D. J. Lipman. 1997. Gapped BLAST and PSI-BLAST: A new generation of protein database search programs. Nucl. Acids Res. 25: 3389–3402.

Brown, N. E. 1895. Diagnoses Africanae VIII. Bull. Misc. Inform. Kew 1895: 247–265.

Bullock, A. A. 1963. Asclepiadaceae. Pp. 85–103 *in* J. Hutchinson & J. M. Dalziel (editors), Flora of West Tropical Africa, Vol. 2. Milbank, London.

Cufodontis, G. 1960. Asclepiadaceae. *In* Enumeratio Plantarum Aethiopiae Spermatophyta. Bull. Jard. Bot. État 30(Suppl.): 693–708.

Friedmann, F. 1994. Asclepiadaceae. Pp. 470–484 *in* Flore des Seychelles, Vol. Dicotylédones. Orstom, Paris.

Li, D.-Z., S.-X. Qiu & C.-Y. Wu. 1990. The chemotaxonomy of *Cynanchum* and its allied genera. Acta Phytotax. Sin. 28: 461–466.

Liede, S. 1996a. *Cynanchum–Rhodostegiella–Vincetoxicum–Tylophora*: New considerations on an old problem. Taxon 45: 193–211.

———. 1996b. A revision of *Cynanchum* (Asclepiadaceae) in Africa. Ann. Missouri Bot. Gard. 83: 283–345.

———. 2001. Molecular considerations on the subtribe Astephaninae Endl. ex Meisn. (Apocynaceae–Asclepiadoideae). Ann. Missouri Bot. Gard. 88: 657–668.

——— & H. Kunze. 1993. A descriptive system for corona analysis in Asclepiadaceae and Periplocaceae. Pl. Syst. Evol. 185: 275–284.

——— & ———. 2002. *Cynanchum* and the Cynanchinae (Apocynaceae–Asclepiadoideae) —a molecular, anatomical and latex triterpenoid study. Organisms Diversity Evol. 2: 239–269.

——— & A. Täuber. 2002. Circumscription of the genus *Cynanchum* (Apocynaceae–Asclepiadoideae). Syst. Bot. 27: 789–801.

———, ——— & J. Schneidt. 2002. Molecular considerations on the Tylophorinae K. Schum. (Apocynaceae–Asclepiadoideae). Edinburgh J. Bot. 59: 377–403.

Oliver, D. 1888. Flora of Somaliland. Pp. 317–323 *in* F. L. James (editor), The Unknown Horn of Africa: An Exploration from Berbera to the Leopard River. G. Philip, London.

Schumann, K. 1895. Asclepiadaceae. Pp. 189–305 *in* A. Engler & K. Prantl (editors), Die Natürlichen Pflanzenfamilien, Vol. 4, 1. Engelmann, Leipzig.

Schweinfurth, G. 1867. Beitrag zur Flora Aethiopiens. Reimer, Berlin.

Wight, R. 1834. Contributions to the Botany of India. Parbury, Allen, London.

Begonia hahiepiana, a New Species of *Begonia* Section *Sphenanthera* (Begoniaceae) from Vietnam

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Abstract. *Begonia hahiepiana* H. Q. Nguyen & Tebbitt (Begoniaceae: section *Sphenanthera* (Hasskarl) Warburg), a new species from Phu Tho Province, Vietnam, is described and illustrated. This new species is most readily distinguished from the closely related *B. balansana* Gagnepain and *B. ceratocarpa* S. H. Huang & Y. M. Shui by its upper leaf surfaces, which are an iridescent dark blue (rather than glossy green) and have deeply sunken veins giving them a puckered appearance (rather than smooth), by its outer pair of tepals having a covering of red trichomes on their outer surfaces (rather than appearing glabrous throughout), and by its fruits, which are spherical with three thickened rib-like wings (rather than being either rhomboidal with three horned appendages or star shaped with six, or sometimes five or seven, fleshy wedge-shaped points). Fieldwork indicates that the new species has a restricted distribution and a total population of less than 1000 individuals; it is recommended to be placed in the IUCN category VU D 1, 2.

Key words: *Begonia*, Begoniaceae, IUCN category VU D 1, 2, section *Sphenanthera*, Vietnam.

Begonia L. comprises roughly 1500 species distributed throughout the tropics and subtropics with the exception of northern Australia (Tebbitt, 2005). Because of its large size, *Begonia* has traditionally been subdivided into numerous sections. In the most recent inventory of the *Begonia* sections, Doorenbos et al. (1998) recognized 63 sections. However, since that publication, three new sections have been described (Shui et al. 2002; Forrest & Hollingsworth, 2003; de Wilde & Plana, 2003), bringing the total number to 66. Most sections are recognized based on a combination of morphological characteristics, with tepal number and characteristics of the styles, stigmas, ovaries, and fruit being particularly emphasized. As part of a taxonomic revision of Vietnamese *Begonia* conducted by the first author, a species from *Begonia* section *Sphenanthera* (Hasskarl) Warburg is here newly recognized.

Begonia sect. *Sphenanthera* is distributed from northeastern India, eastward to Taiwan and southward to Malaysia and Indonesia (Doorenbos et al., 1998). The section currently includes almost all the ca. 25 Asian species with fleshy baccate fruit and at one time was circumscribed solely on the basis of this characteristic (e.g., Irmscher, 1925). However, Shui et al. (2002) now recognize three Asian fleshy fruited *Begonia* species as constituting the section *Leprosae* (T. C. Ku) Y. M. Shui: *B. cylindrica* D. R. Liang & X. X. Chen, *B. leprosa* Hance, and *B. longicarpa* K. Y. Guan & D. K. Tian. *Begonia* sect. *Leprosae* is distinguished from section *Sphenanthera* by its members having clavate rather than turbinate fruit (Shui et al., 2002). Currently four species from section *Sphenanthera* are recognized as occurring in Vietnam: *B. acetosella* Craib, *B. balansana* Gagnepain, *B. handelii* Irmscher, and *B. longifolia* Blume (Tebbitt, 2003a, b). A fourth species from section *Leprosae* has recently been described from Vietnam, *B. bataiensis* Kiew (Truong et al., 2005). The three traditional members of this section occur in neighboring areas of southwestern China. The new species recognized here has fleshy, spherical fruit with three thickened rib-like wings and is accordingly assigned in *Begonia* sect. *Sphenanthera*, albeit molecular data (Tebbitt et al., unpublished data) suggest that this section is polyphyletic and requires division into smaller groups.

Within *Begonia* sect. *Sphenanthera* the new species is morphologically most similar to *B. balansana* and *B. ceratocarpa* S. H. Huang & Y. M. Shui. A particularly noticeable characteristic of this group is the prominent tertiary venation on the lower leaf surfaces. The new species is distinguished most readily from *B. balansana* by its upper leaf surface that is an iridescent dark blue (rather than glossy

green), by the pistillate flowers having five tepals (rather than four) and three styles (rather than six, or sometimes five or seven), and by the fruits that are spherical with three thickened rib-like wings and which have three locules (rather than star shaped with six, or sometimes five or seven, fleshy wedge-shaped points and six, or sometimes five or seven, locules). The new species is distinguished from *B. ceratocarpa* most readily by its relatively short petiole (10–13 cm long vs. 23–30 cm long); its ciliate-denticulate leaf margin (rather than irregularly repand); its green to white tepals (rather than white, tinged pink); its outer pair of tepals in the staminate flowers, which are ovate (rather than broadly ovate to suborbicular) and are covered with red trichomes on their outer surfaces (rather than being glabrous throughout); its inner pair of tepals in the staminate flowers, which are oblong (rather than obovate to lanceolate); and its fruits, which are spherical with three thickened rib-like wings (rather than rhomboidal with three horned appendages).

Begonia hahiepiana H. Q. Nguyen & Tebbitt, sp. nov. TYPE: Vietnam. Phu Tho Province: Thanh Son Distr., Xuan Son Mun., Xuan Son Nat. Park, shade on limestone-derived soil, 324 m, 30 Nov. 2000, *V. X. Phuong, N. K. Khoi, N. Q. Binh & H. Q. Nguyen 3941* (holotype, HN; isotype, MO). Figure 1.

Haec species inter species sectionis *Sphenantherae* quoad foliorum venas laterales basales abaxialiter prominentes ad *B. balansanam* et *B. ceratocarpam* accedit, sed ab ambabus floris masculini tepalis extus longe pilosis et fructu globoso alis 3 brevibus crassis praedito recedit.

Acaulescent herb, 15–18 cm tall. *Rhizome* prostrate, 4–6 mm diam., with a sparse covering of uniseriate hairs. *Stipules* persistent, red or purple, triangular to lanceolate, 7–10 × 4–6 mm, apex acuminate, margin entire; *leaves* alternate; *petiole* pink, with a sparse villose indumentum of uniseriate hairs, 10–13 cm long, grooved, joining lamina at an angle; *lamina* upper surface iridescent dark blue, glabrous, lower surface pink with dense red, villous hairs on the main veins, elsewhere glabrous, asymmetric, broadly ovate, 10–13 × 7–9 cm, apex truncate, base obliquely cordate, margin ciliate-denticulate; venation palmate, main veins 7 or 8, tertiary veins reticulate, conspicuous. *Inflorescence* 5- or 6-flowered, cymose; *peduncle* erect, densely red pilose, 2–4 cm long; *bracts* persistent, green to purple, red pilose, lanceolate, ca. 10 × 5 mm, apex acuminate, margin entire. *Flowers* green to white; *staminate flowers*: *pedicels* ca. 2 cm long; *tepals* 4, green to white, outer pair ovate, ca. 1.3 × 0.6 cm, apex obtuse, margin entire, red pilose on outer surface; inner pair oblong, 1.2–1.8 × ca. 0.4 cm, apex obtuse to rounded, margin entire, glabrous throughout; *androphore* absent; *stamens* ca. 50, yellow, arranged in an actinomorphic cluster, ca. 0.5 mm diam.; *filaments* free, ca. 1.2 mm long; *anther* obovate, ca. 1 mm long, connective not projecting; *pistillate flowers* with pedicel ca. 0.5 cm long; *bracteoles* absent; *tepals* 5, green to white, outer 3 broadly ovate, ca. 0.8 × 0.8 cm, apex obtuse, margin entire; inner 2 oblong, 0.7–0.8 × 0.3–0.6 cm, apex obtuse to rounded, margin entire; *ovary* green, with short red indumentum, ca. 0.5 mm long, spherical with 3 thickened rib-like wings, ca. 0.3 cm diam., 3-locular, *placentation* axile, 2 placentae per locule; *styles* 3, free, 1–1.2 mm long, yellow, bifid, stigmatic papillae arranged in a spiral band. *Fruits* pendulous, green, appearing indehiscent, spherical with 3 thickened rib-like wings, ca. 0.9 cm diam., red hirsute throughout.

Distribution and habit. The new species is a narrow endemic of northern Vietnam, in Phu Tho Province (Thanh Son District). Its habitat is similar to that of *Begonia balansana*; both are terrestrial taxa on soil banks or in shaded limestone-derived soil. *Begonia balansana* is a narrow endemic of Mount Bavi, Vinh Phu Province, Vietnam, while *B. ceratocarpa* is endemic to Hekou County in southern Yunnan Province, China. Fieldwork indicates that the new species has a restricted distribution and a total population of less than 1000 individuals and is recommended to be placed in the IUCN category VU D 1, 2 (VU: vulnerable; D: criteria for population very small (1) or restricted (2)).

Etymology. The epithet honors the first author's parents Nguyen Tien Hiep and Nguyen Bich Ha, who are thanked for nurturing his interest in botany.

Paratype. VIETNAM. **Phu Tho Province:** Thanh Son Distr., Xuan Son Mun., Xuan Son National Park, shade on limestone-derived soil, *N. T. Hiep et al. 6142* (HN).

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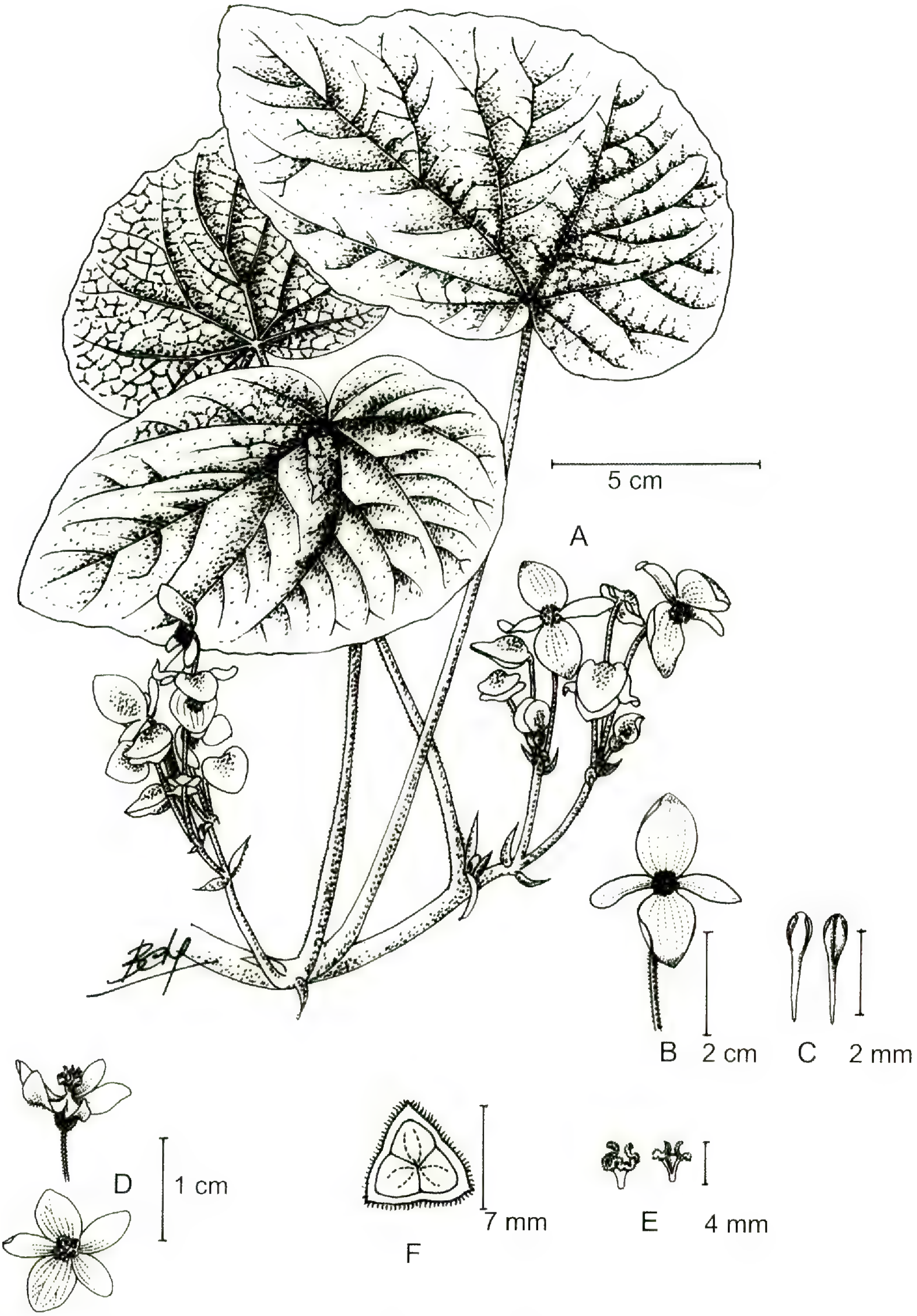

Figure 1. *Begonia hahiepiana* H. Q. Nguyen & Tebbitt. —A. Habit. —B. Staminate flower. —C. Stamens. —D. Pistillate flower. —E. Style. —F. Cross section of ovary. Drawn from the holotype, *Phuong et al. 3911* (HN), by Bui Xuan Chuong.

Literature Cited

de Wilde, J. J. F. E. & V. Plana. 2003. A new section of *Begonia* (Begoniaceae) from West Central Africa. Edinburgh J. Bot. 60(2): 121–130.

Doorenbos, J., M. S. M. Sosef & J. J. F. E. de Wilde. 1998. The sections of *Begonia* including descriptions, keys and species lists (Studies in Begoniaceae VI). Wageningen Agric. Univ. Pap. 98/2.

Forrest, L. L. & P. M. Hollingsworth. 2003. A recircumscription of *Begonia* based on nuclear ribosomal sequences. Pl. Syst. Evol. 241: 193–211.

Irmcher, E. 1925. Begoniaceae. Pp. 548–588 *in* A. Engler & K. Prantl (editors), Die Natürlichen Pflanzenfamilien, 2nd ed. Engelmann, Leipzig.

Shui, Y. M., C. I. Peng & C. Y. Wu. 2002. Synopsis of the Chinese species of *Begonia* (Begoniaceae), with a reappraisal of sectional delimitation. Bot. Bull. Acad. Sin. 43: 313–327.

Tebbitt, M. C. 2003a. Taxonomy of *Begonia longifolia* Blume (Begoniaceae), and related species. Brittonia 55: 19–29.

———. 2003b. Notes on southeastern Asian *Begonia* (Begoniaceae). Edinburgh J. Bot. 60(1): 1–9.

———. 2005. Begonias: Cultivation, Identification and Natural History. Timber Press, Portland.

Truong, Q. T., R. Kiew & J. J. Vermeulen. 2005. *Begonia bataiensis* Kiew, a new species in section *Leprosae* (Begoniaceae) from Vietnam. Gard. Bull. Singapore 57(1): 19–23.

Isostigma sparsifolium (Asteraceae, Heliantheae, Coreopsidinae), a New Species from Goiás, Brazil

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Abstract. A new species, *Isostigma sparsifolium* G. Peter, from central Brazil (State of Goiás), resembles *I. brasiliense* (Gardner) Bentham & Hooker f. in habit: both species are perennial, with stems branched at the base, ascendant, with peduncles erect, involucres bell-shaped, capitula up to 9 mm high and 12 mm in diameter, and the pappus aristae completely hispid. Nevertheless, *I. sparsifolium* can be distinguished by its pinnatisect leaves distributed along the stems, the stems winged, the peduncles shorter, and the ray corollas white.

Resumen. Una nueva especie, *Isostigma sparsifolium* G. Peter, de Brasil central (Estado de Goiás), es similar a *I. brasiliense* (Gardner) Bentham & Hooker f. en hábito; ambas especies son perennes, con tallos ramificados en la base, ascendentes, con pedúnculos erectos, involucros acampanados, capítulos hasta 9 mm alt. y 12 mm diam., y las aristas del papus completamente híspidas. *Isostigma sparsifolium* puede ser distinguida por sus hojas pinnatisectas distribuidas a lo largo de los tallos, tallos alados, pedúnculos más cortos, y corolas de las flores del radio blancas.

Key words: Asteraceae, Brazil, Coreopsidinae, Heliantheae, *Isostigma*, IUCN Conservation Status.

During a revision of *Isostigma* Lessing, indeterminate material from Brazil was found. This material does not correspond with any previously described species and belongs to a new species. It is added to the known Brazilian species: *I. brasiliense* (Gardner) Bentham & Hooker f., *I. crithmifolium* Lessing, *I. peucedanifolium* (Sprengel) Lessing, *I. riedelii* (Baker) Chodat, *I. scorzonerifolium* (Baker) Sherff, *I. simplicifolium* Lessing, and *I. speciosum* Lessing.

Isostigma (Asteraceae, Heliantheae, Coreopsidinae) is considered to be akin to *Chrysanthellum* Richard and *Glossocardia* Cassini (Ryding & Bremer, 1992; Karis & Ryding, 1994). *Isostigma* is a scarcely studied assemblage of 11 to 13 species (Sherff, 1926, 1931; Cabrera, 1959; Peter, 2005) of perennial herbs and subshrubs distributed in northeastern and central Argentina, southern Brazil, southeastern and central Bolivia, Paraguay, and northwestern Uruguay. *Isostigma* includes plants with stems simple or scarcely branched, striate, glabrous; leaves rosulate or distributed along the stems, entire with the apex entire or dentate, pinnate to multipinnatisect; capitula bell-shaped or cylindric, solitary or in pseudocorymbs; phyllaries in three to four rows, with margins hyaline and ciliate; receptacles flat, alveolate, with paleae membranous, keeled at the base; ray florets generally present, pistillate, with corollas 2- to 3-toothed, yellow, white, or purple; disc florets bisexual, with corollas tubular, 4- to 5-lobate; anthers obtuse with appendages ovate; styles with two branches, papillose on the inner face, with filiform appendages, covered by hairs on the outer face; cypselae linear, flattened, glabrous or hispid; pappus 2-aristate to null, aristae triangular or aciculer, divergent or erect, smooth or hispid.

Isostigma sparsifolium G. Peter, sp. nov. TYPE: Brazil. Goiás: 37 km NW of Itumbiara on rd. to Rio Verde, 2 Feb. 1959, *H. S. Irwin 2543* (holotype, F; isotypes, TEX, UC not seen). Figure 1.

Haec species *I. brasiliensi* similis, sed caulibus alatis, foliis sparsis alternis pinnatisectis, pedunculis foliatis 3–9 cm longis, corollis marginalibus albis differt.

Perennials 10–15 cm tall, glabrous; *stems* branched from bases, ascending, leafy, with narrow hyaline wings. *Leaves* usually alternate, rarely opposite, 15–30 mm long, pinnatisect, bases semiamplexicaul, leaflets 1 to 3 pairs, filiform 5–30 × 0.2 mm, margins hyaline, ciliate at bases. *Heads* solitary, axillary and terminal, 7–8 × 13–20 mm in flower, 7–8 × 6–9 mm in fruit; *peduncles* erect, leafless or leafy at bases, 30–90 × 0.5–1.5 mm; *involucres* bell-shaped to hemispheric, 3–4 × 4–5 mm. *Receptacles* alveolate, *paleae* 3- to 5-nerved, yellow, linear to narrowly obovate, 3.5 × 0.7 mm, membranous, keeled, veins with glandular trichomes, margins erose, apices acute, rounded, or mucronate. *Phyllaries* brown, in 3 series, scarious, margins hyaline, ciliate; outer triangular, 1–1.7 × 0.5 mm, apices acute; inner triangular to narrowly ovate, 2–4 × 0.8–1 mm.

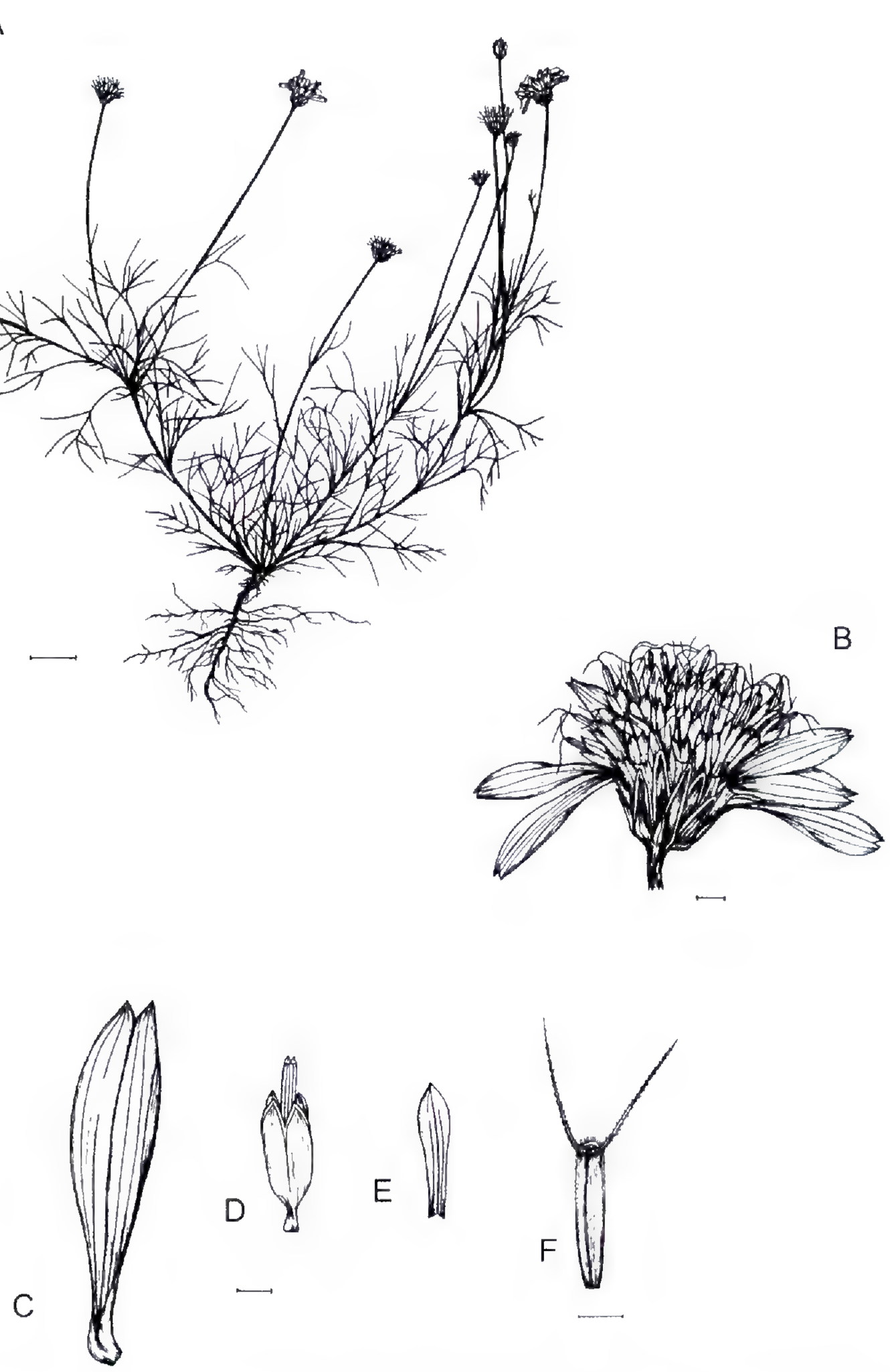

Figure 1. *Isostigma sparsifolium* G. Peter. —A. Habit. —B. Capitulum with florets. —C. Ray corolla. —D. Disc floret (style removed).—E. Palea. —F. Cypsela. Scale bars: A = 1 cm; B–F = 1 mm. Drawn from the holotype *Irwin 2543* (F).

apices acute, rounded, or mucronate; *ray florets* pistillate; corollas white with brown nerves, tubes 0.5 mm long, laminae elliptic or obovate, 6–9 × 1.5–3.5 mm, 4- to 5-nerved, teeth 2, 1–1.5 mm long, acute or rounded; *disc florets* bisexual, corollas yellow with brown veins, tubes 0.7–1 mm long, limbs abruptly broadened, 2–4 mm long, glabrous, lobes 4, 0.7–1 mm long, acute; anthers 1.5–2 mm long; style appendages 2 mm long. *Cypselae* yellow, brown, or black, linear, flattened or trigonous, 3–3.5 × 0.5–0.7 mm, striate, midribs conspicuous, hispid distally (on margins, apices, or ribs); *pappus* a ciliate crown and 2 acicular, erect or divergent, hispid aristae 2–4 mm long.

Etymology. The specific epithet of the new taxon refers to the distribution of leaves along the stems, in contrast to the rosulate leaves of the morphologically closest species, *Isostigma brasiliense*.

Distribution and habitat. *Isostigma sparsifolium* is known only from the state of Goiás, in central Brazil. It grows among grasses in forest clearings on brown sandy soils. This species is only known from its type locality, and there is no information about its current status. Due to that, its IUCN Conservation Status should be DD (Data Deficient) (IUCN, 2005).

Isostigma sparsifolium is closely related to *I. brasiliense*. Both species are perennial herbs or subshrubs, with stems branched at the base, ascendant, with erect peduncles, involucres bell-shaped, capitula up to 9 mm high and 12 mm diam., and with completely hispid pappus aristae. The new taxon is distinguished from *I. brasiliense* by its pinnatisect leaves distributed along the stems (vs. leaves pinnatisect or simple, rosulate at the base of the peduncle), winged stems (vs. stems wingless), peduncles 3–9 cm long (vs. 8–25 cm long), ray corollas white (vs. yellow

ray corollas), and the pappus of a ciliate crown between two aristae (vs. only the two aristae).

The type specimen of *Isostigma sparsifolium*, *Irwin 2543*, was previously determined as *I. impala*, nom. nud., by Smith and Turner (1975), in a work about Kranz syndrome in Asteraceae. Nevertheless, this name was not accompanied by any description; furthermore, these researchers did not mention it as belonging to a new species.

Key to the Brazilian Species of *Isostigma*

1a. Capitula in pseudocorymbs . . . . . *I. scorzonerifolium* (Baker) Sherff

1b. Capitula solitary.

2a. Leaves entire, dentate, or briefly furcate at the apex.

3a. Leaves subulate or filiform, 5–70 × 0.2–0.5 mm; apex acute or mucronate; rosulate at bases of peduncles; capitula up to 12 mm diam.; ray corollas yellow; cypselae hispid . . . . . *I. brasiliense* (Gardner) Bentham & Hooker f.

3b. Leaves linear, 50–450 × 1.5–9 mm, apex entire, acute, rounded, mucronate, 3-dentate or 3-furcate; rosulate at bases of stems; capitula wider than 13 mm; ray corollas purple; cypselae glabrous.

4a. Stems isodiametric all along, 4- to 7-bracteolate distally; capitula 10–15 × 13–19 mm; involucres 8 × 13–15 mm . . . . *I. simplicifolium* Lessing

4b. Stems generally expanded at bases of capitula, 20- to 50-bracteolate distally; capitula 12–30 × 20–60 mm; involucres 10–12 × 18–40 mm . . . . . *I. riedelii* (Baker) Chodat

2b. Leaves divided.

5a. Leaves distributed along the stems; ray corollas white . . . . . *I. sparsifolium* G. Peter

5b. Leaves rosulate; ray corollas yellow or purple.

6a. Leaves rosulate at bases of peduncles; subshrubs up to 35 cm; ray corollas yellow . . . . . *I. brasiliense* (Gardner) Bentham & Hooker f.

6b. Leaves rosulate at bases of stems; herbs to 2 m; ray corollas purple.

7a. Stems expanded at bases of capitula (1–7 mm wide), more than 20-bracteolate distally . . . . . *I. speciosum* Lessing

7b. Stems isodiametric all along (up to 3 mm at bases of capitula), fewer than 10-bracteolate distally.

8a. Leaves pinnatisect to multipinnatisect, leaflets subulate or filiform, 0.2–0.7 mm wide; petioles and leaflets canaliculate . . . . *I. peucedanifolium* (Sprengel) Lessing

8b. Leaves pinnatisect or bipinnatisect, leaflets linear, 0.5–1.3 mm wide; petioles and leaflets flat. . . . . *I. crithmifolium* Lessing

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Literature Cited

Cabrera, A. L. 1959. Ocho compuestas sudamericanas nuevas. Notas Mus. La Plata 19: 202–204.

IUCN. 2003. Guidelines for Using the IUCN Red List Categories and Criteria. Prepared by the Standards and Petitions Subcommittee of the IUCN SSC Red List Programme Committee. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.

Karis, P. O. & O. Ryding. 1994. Tribe Heliantheae. Pp. 559–624 *in* K. Bremer (editor), Asteraceae: Cladistics and Classification. Timber Press, Portland, Oregon.

Peter, G. 2005. Revisión, análisis cladístico y análisis biogeográfico del género *Isostigma* Less. (Asteraceae, Heliantheae, Coreopsidinae). Tesis Doctoral, Universidad Nacional del Sur, Argentina.

Ryding, O. & K. Bremer. 1992. Phylogeny, distribution, and classification of the Coreopsideae (Asteraceae). Syst. Bot. 17: 649–659.

Sherff, E. E. 1926. Revision of the genus *Isostigma* Less. Bot. Gaz. 81: 241–257.

———. 1931. New or otherwise noteworthy Compositae. VI. Bot. Gaz. 91: 308–314.

Smith, B. N. & B. L. Turner. 1975. Distribution of Kranz syndrome among Asteraceae. Amer. J. Bot. 62: 541–545.

Crataegus spes-aestatum, a New Species in Series *Punctatae* (Rosaceae), and Six New Varietal Names from the Missouri *Crataegus* Flora

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Abstract. *Crataegus spes-aestatum* J. B. Phipps is described as a new species from Missouri and Illinois. It is critically compared to *C. dawsoniana* Sargent, to which it keys out in the article where that species was published, and which is here lectotypified. Also, lectotypes for the following new combinations or status from the Missouri *Crataegus* flora are designated: *C. collina* Chapman var. *hirtiflora* (Sargent) J. B. Phipps, *C. crus-galli* L. var. *regalis* (Beadle) J. B. Phipps, *C. pruinosa* (H. L. Wendland) K. Koch var. *magnifolia* (Sargent) J. B. Phipps, *C. reverchonii* Sargent var. *palmeri* (Sargent) J. B. Phipps, *C. viridis* L. var. *glabriuscula* (Sargent) J. B. Phipps, and *C. viridis* L. var. *nitens* (Sargent) J. B. Phipps. In addition, lectotypes are designated for the varietal basionyms *C. hirtiflora* Sargent, *C. regalis* Beadle, *C. magnifolia* Sargent, *C. palmeri* Sargent, and *C. glabriuscula* Sargent, as well as for several of the species names involved, *C. collina* Chapman, *Mespilus pruinosa* H. L. Wendland, and *C. reverchonii* Sargent. Also, a lectotype and epitype for *C. berberifolia* Torrey & A. Gray, a species with a Missouri variety, are indicated.

Key words: *Crataegus*, Missouri, Rosaceae.

Intensive study of over 4000 hawthorn specimens for George Yatskievych's *Steyermark's Flora of Missouri* results in the recognition of a new species for the state, *Crataegus spes-aestatum* J. B. Phipps. In this paper I shall describe this long-overlooked member of the Missouri *Crataegus* flora and also establish six new varieties based on earlier species names of Sargent and Beadle. The new varieties are: *C. collina* Chapman var. *hirtiflora* (Sargent) J. B. Phipps, *C. crus-galli* L. var. *regalis* (Beadle) J. B. Phipps, *C. pruinosa* (H. L. Wendland) K. Koch var. *magnifolia* (Sargent) J. B. Phipps, *C. reverchonii* Sargent var. *palmeri* (Sargent) J. B. Phipps, *C. viridis* L. var. *glabriuscula* (Sargent) J. B. Phipps, and *C. viridis* L. var. *nitens* (Sargent) J. B. Phipps. The autonyms for the varietal combinations will also be typified where necessary.

Crataegus spes-aestatum

Working at US in summer 1996, I located a number of specimens of an unusual *Crataegus collina* Chapman–like taxon, all collected by E. J. Palmer, and requested their loan. Then, during 2000–2001, working with G. Yatskievych in St. Louis, I found further examples of the same entity, one collected by J. H. Kellogg, such that 12 specimens of this entity are now recorded by me at MO and US. All except the Kellogg record (1908) were collected by Palmer from 1919–1931 in southern Illinois and counties mostly close to the Mississippi in the southern half of Missouri. These had been variously determined as *C. vicina* Sargent, *C. sucida* Sargent, and *C. mollis* (Torrey & A. Gray) Scheele × *C. sucida*, but to me were clearly none of these. Although Palmer's inconsistent determinations suggested substantial variability, these 12 collections appeared not only to be taxonomically identical, but rather invariant. Interestingly, none of the specimens of the new entity located by me at US or MO had been filed under *C. collina*. They differed strikingly from *C. collina* in their sharply lobed and rhombic-elliptic leaf shape of a size at the upper limit for that species, thus making them reminiscent of certain forms of *C. viridis* L. Because of this, I initially considered the possibility that they represented a hybrid entity. Indeed, keying them out in Sargent (1908) led to *C. dawsoniana* Sargent, placed by him in group *Virides*, but now regarded as a putative interserial hybrid (Phipps, 2005). Accordingly, I accessed the syntypes and other authentic material of *C. dawsoniana* from A and made comparisons (Table 1) between *C. dawsoniana* and *C. collina*. These comparisons, however, indicate that the new entity is much closer to *C. collina*. The main differences between the new entity and *C. dawsoniana* lay in the denser indumentum of the leaves of the Palmer and Kellogg collections, slightly different leaf shape, much larger flowers, and less pruinose fruit. Although Palmer had mostly labeled these specimens as the *collina* segregates *C. vicina* (leaves not or barely lobed) or *C. sucida* (leaves unlobed), there is a distinct and quite sharp lobing (see Fig. 1) in the leaves of the

Table 1. Differences between *Crataegus spes-aestatum*, *C. dawsoniana*, and *C. collina* var. *collina*. Parenthetic numbers indicate indumentum density on a scale from 0 (glabrous) to 5 (very dense). Abbreviations: A.A. Arnold Arboretum; fl., flowered; S, southern.

Characteristic	*C. dawsoniana*	*C. spes aestatum*	*C. collina* var. *collina*
1-yr.-old twigs	deep chestnut, ± shiny	chestnut, shiny	grayish brown
Thorns	not observed	thin, straight, 3–5 cm long, shiny, dark	slender to ± stout, ± straight, blackish
Leaves at anthesis			
Petioles	glabrous below, thin-pilose on top (2 to 3)	canescent (5)	pubescent to canescent (4 to 5)
Adaxial surface	nearly glabrous	appressed-scabrous-pubescent (4)	scabrous-pubescent when young (3 to 4)
Adaxial veins	scabrous (3)	very short-scabrous (3)	very short-scabrous (3 to 4)
Abaxial surface	glabrous	thin hairy (1)	thin hairy (1 to 2)
Abaxial veins	glabrous	canescent (4 to 5)	appressed-pubescent (5)
Leaf shape	apex acute, lobes very short	apex acuminate, more prominent lobes	usually narrow obovate, small or no lobes
Anthesis date	1 June 1900 (at A.A.)	10 May 1923 (S IL); 25 Apr. 1931 (S MO, rather late fl.); 26 Apr. 1931 (S MO, full fl.); 27 Apr. 1931 (S MO)	24–30 Apr. (S MO)
Pedicels	thin spreading-pubescent (2 to 3)	canescent (4)	appressed-pubescent (4 to 5)
Bracteoles	linear, membranous, green, gland margined	linear to broader, greenish, gland serrate	linear, membranous, gland bordered
Flower diameter	14–15 mm	20–22 mm	13–18 mm
Hypanthium	pubescent (3)	white-canescent (5)	glabrous-thin pubescent (4 to 5)
Sepals	entire to slightly glandular-serrate	deeply glandular-serrate	glandular-serrate
Styles	4 or 5	5	3 to 5
Fruit	8–10 mm diam., pruinose, smooth, slightly pyriform, calyx lobes reflexed	10–12 mm diam., not pruinose, some hair left, calyx lobes reflexed, surface matte, ± globose	8–11 mm diam., usually ± glabrous

new entity, which immediately puts it out of these segregate taxa. The striking leaf size and shape characteristics of the new entity, as well as the rather more glabrate fruit, thus differentiate it from any variant of *C. collina*. The quite extensive and mainly Mississippian two-state distribution is also distinctive. Accordingly, I considered the new entity sufficiently distinct to warrant specific rank and describe it below. The similarities are closest between *C. spes-aestatum* and *C. collina*, however, requiring placement of the novelty in *Crataegus* ser. *Punctatae* (Loudon) Rehder.

Crataegus spes-aestatum J. B. Phipps, sp. nov. TYPE: U.S.A. Missouri: Bollinger Co., 26 Apr. 1931, *E. J. Palmer 39098* (holotype, MO; isotype, US). Figure 1.

A Crataego collina differt in ramunculis annotinis nitidis castaneo-brunneis (non cinereo-brunneis), acanthibus semper tenuibus (non, ut saepe, validis); apicibus laminarum acutioribus, lobis acutioribus (non apicibus laminarum minus acutis, lobis aut absentibus, praeter *C. collinam* var. *lettermanii*); floribus majoribus (20–22 mm. diam. potius quam 13–18 mm diam.), lobis calycis penitus (non, ut plerumque, moderate) glandulo-serratis.

Shrubs or small trees, 3–6 m tall; extending shoots canescent; 1-yr.-old twigs reddish brown, older ± pale gray; thorns on 2-yr.-old wood 2.5–6 cm long, fairly slender, silver-black, straight or slightly curved. Leaves deciduous; petioles 0.75–1.5 cm long, ca. 20%–25% blade length, densely pubescent young, subglabrous later, with a few sessile glands; blades 3–4 cm long (at anthesis), 4–6 cm at maturity, ± rhombic-elliptic; apex acuminate, base cuneate; 3 or 4 shallow but acute lobes per side; margins sharply toothed, teeth gland-tipped; venation craspedodromous, 4 to 5 main secondary veins per side; adaxial surface scabrous-pubescent when young, abaxially densely pubescent on the veins when young, with scattered pubescence elsewhere on the lower surface. Inflorescences 6- to 12-flowered; branches densely canescent, bearing caducous, linear, membranous or somewhat chlorophyllous, gland-margined bracteoles.

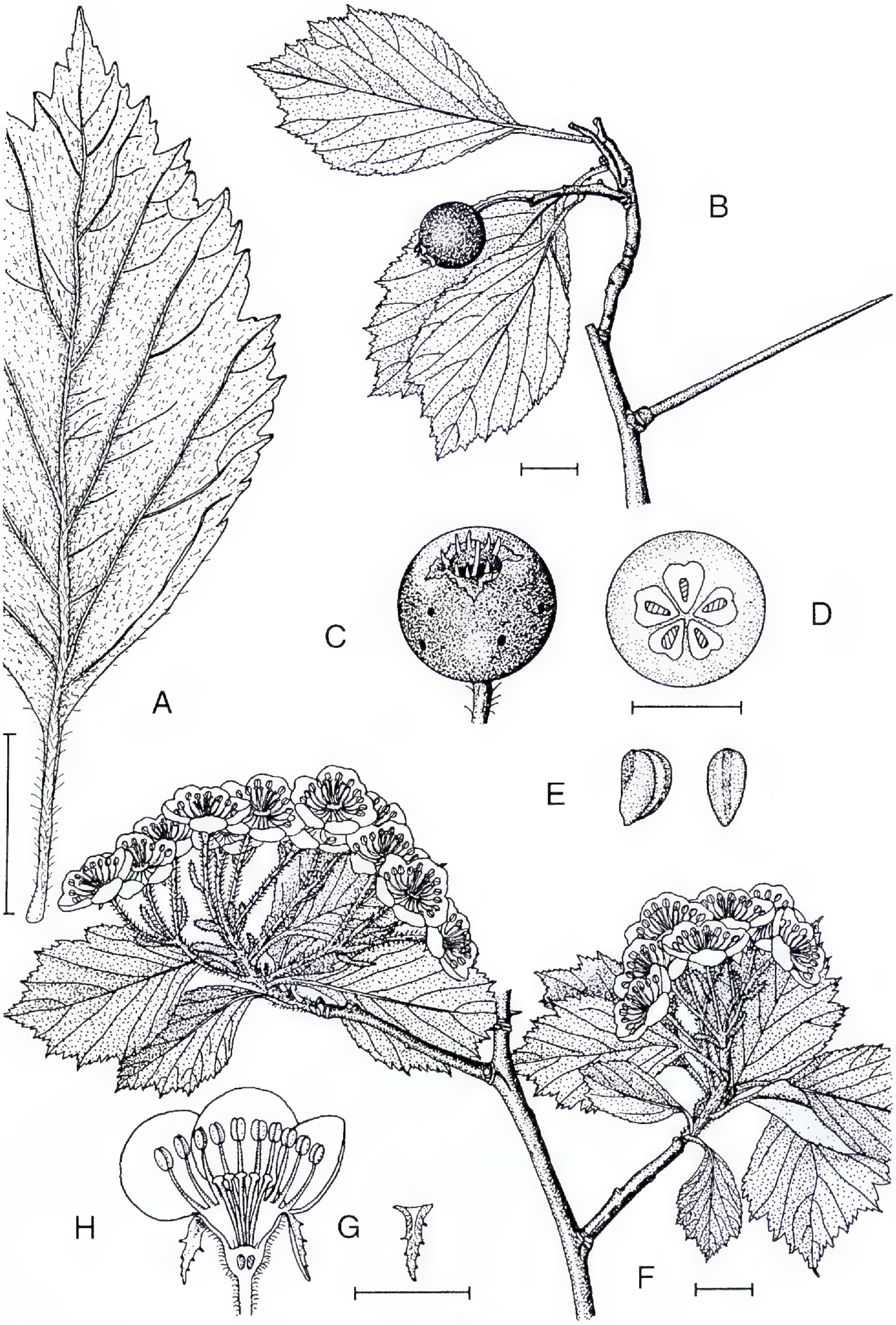

Figure 1. *Crataegus spes-aestatum* J. B. Phipps. —A. Partial leaf magnification, abaxial surface. —B. Fruiting twig with foliage. —C. Fruit. —D. Fruit, section. —E. Nutlets, side and dorsal views. —F. Inflorescences and twig part. —G. Single calyx lobe. —H. Flower section. Inflorescence and flower parts from *E. J. Palmer 39098* (MO) and *E. J. Palmer 39077* (MO); fruiting stage from *E. J. Palmer 17000* (MO). Scale bars = 1 cm.

Flowers 20–22 mm diam.; hypanthium externally canescent; calyx lobes narrow-triangular, abaxially thinly pubescent, glandular-serrate; petals ± circular, white; stamens 20, anthers "yellow" or "cream-colored" (Palmer, from cited specimens); styles 5. Fruit 10–12 mm diam. (dry), ± globose, ± glabrous but short-pubescent at top and bottom, surface matte, apparently red; calyx lobes recurved ± eroded; nutlets 3 to 5, dorsally grooved, sides plane.

Crataegus spes-aestatum is known from southern Illinois and in southern, south-central, and southeastern Missouri from only nine collection numbers (12 specimens) and is mainly recorded from thickets, low hills, dry open woods, and alluvial riverbanks. *Crataegus spes-aestatum* has not been with certainty seen for over 70 years and resembles *C. fecunda* Sargent in this respect, as well as in its distribution pattern and frequency. Indeed, the much greater rarity of all Missouri *Crataegus* since the first half of the last century (Phipps, 2005) is quite noteworthy, and *C. spes-aestatum* and *C. fecunda* are far from the only examples of probable extinction of local biotypes in the state (Phipps, 2005; G. Yatskievych, pers. comm.). Such intriguing parallels between *C. spes-aestatum* and *C. fecunda* call out for further enquiry.

The name honors Bill Summers, the important Missouri hawthorn collector, who has made strenuous efforts to relocate the new species in southeastern Missouri. Further serious searching through the historic range of *Crataegus spes-aestatum* is still required to determine if it survives into the 21st century. The specific epithet is derived from *spes* (Latin) = hope and *aestatum* (Latin) = summers. The hyphen use, supported by Art. 60.9 of the *International Code of Botanical Nomenclature (St. Louis Code)* (ICBN) (Greuter et al., 2000), is intentional, and should not be changed.

Paratypes. U.S.A. **Illinois:** Pope Co., nr. Golconda, *E. J. Palmer 22581* (US); Golconda, *E. J. Palmer 17000* (MO), *E. J. Palmer 15426* (US), *23672* (US). **Missouri:** Bollinger Co., nr. Patton, *E. J. Palmer 39098* (MO, US); Cape Girardeau Co., nr. Cape Girardeau, *E. J. Palmer 39077* (MO, US); Greene Co., SW Springfield, *J. H. Kellogg 110* (MO); St. Genevieve Co., nr. Appleton, *E. J. Palmer 39109* (MO, US), *39110* (MO).

Crataegus dawsoniana

Crataegus dawsoniana Sargent, Rep. (Annual) Missouri Bot. Gard. 19: 88. 1908. TYPE: U.S.A. Massachusetts: Jamaica Plain, Arnold Arboretum, cult. from Letterman seed 462.3, East St. Louis, Illinois, 1 June 1901, *C. S. Sargent 4428* (lectotype, designated here, A).

In order to formalize the comparisons of *Crataegus spes-aestatum* and *C. dawsoniana*, lectotypification of the latter is required. The lectotype is a good-quality specimen in full flower exactly matching the protologue description. Other specimens at A raised from the same seed batch are also labeled *Sargent 4428*, but were collected at different times (viz., 7 June 1901, Forest Hill entrance; 8 Oct. 1900; 8 Nov. 1898). There is now no way to determine for sure if these specimens actually came from the same tree and also, as there is some variation in leaf shape, making any of them isolectotypes is not appropriate. All the *C. dawsoniana* syntypes had been accessed originally as *C. nitida* (Engelmann) Sargent, a member of series *Virides* (Loudon) Rehder, but it is more likely that *C. dawsoniana* represents an interserial hybrid between series *Punctatae* and series *Virides*.

New Crataegus Names from Missouri

Several new combinations are required for the third volume of the floristic project *Steyermark's Flora of Missouri*, of which the first two volumes have been published (Yatskievych, 1999, 2006).

1. **Crataegus berberifolia** Torrey & A. Gray, Flora of North America 1: 469. 1840. TYPE: U.S.A. Louisiana: Opelousas, July [no year given], *Carpenter 20* (lectotype, designated here, NY). EPITYPE: U.S.A. Louisiana: Opelousas, in flower, s.d., *Carpenter s.n.* (epitype, designated here, NY).

The information in the protologue, which indicates a specimen collected in July, permits only one candidate for lectotype, that selected. However, its quality being inadequate, I am adding a flowering specimen in excellent condition as epitype.

Crataegus berberifolia is represented in Missouri by its variety *engelmannii* (Sargent) Eggleston, which differs from the type variety in possessing 10 stamens with pink-purple anthers (instead of 20, cream) and generally larger flowers, ca. 18 mm in diameter in the type material (instead of ca. 12 mm). *Crataegus berberifolia* var. *berberifolia* forms are concentrated in Louisiana, while variety *engelmannii* forms range widely through the southeastern quarter of the United States. *Crataegus berberifolia* belongs to series *Crus-galli* (Loudon) Rehder.

2. **Crataegus collina** Chapman, Flora of the Southeastern United States, 2nd ed. Suppl.: 684. 1892. TYPE: U.S.A. Georgia: Floyd Co., Rome, spring 1882, *A. W. Chapman s.n.* (lectotype, designated here, GH).

The lectotype is an excellent-quality flowering specimen that is a good match for the protologue.

2a. Crataegus collina Chapman var. **hirtiflora** (Sargent) J. B. Phipps, comb. et stat. nov. Basionym: *Crataegus hirtiflora* Sargent [as *hertiflora*], Rep. (Annual) Missouri Bot. Gard. 19: 82. 1908. TYPE: U.S.A. Missouri: Taney Co., Swan, 20 Apr. 1907, *B. F. Bush 8* (lectotype, designated here, A; duplicate, A).

The lectotype is an excellent match for the protologue and is one of the two specimens of this number seen by me. This collection number was the one designated "type" by Sargent in the 1908 protologue. Sargent spelled the specific epithet "*hertiflora*" in his protologue (1908: 82), repeating this in his key to series *Punctatae* on page 76 of the same paper. There is no Latin word or root of the form "*hert-*"; however, the flower is so evidently hairy that Sargent's "*hertiflora*" must be regarded as a typographic error, symptomatic of the quite numerous small slips that litter his publications, and the correction to the spelling, first made by Palmer (1925), though without explanation, is in accordance with Art. 60 of the ICBN (Greuter et al., 2000).

Crataegus collina var. *hirtiflora* shares the typical variety *collina* characteristics of indumentum, twig and thorn color, inflorescence, flower, and fruit features, but differs in possessing a relatively much broader leaf blade (1.3 long:1 wide, or less in var. *hirtiflora*, 1.4–1.6:1 in var. *collina*) with relatively greater expansion at anthesis (± full grown at anthesis in var. *hirtiflora;* 1/3–2/3 full grown in var. *collina*). In Missouri, *C. collina* var. *hirtiflora* is found commonly throughout the range of the species, and most specimens can be assigned without ambiguity. Outside of Missouri, however, the range is inadequately documented. *Crataegus collina* var. *hirtiflora* belongs to series *Punctatae* (Loudon) Rehder. The two varieties compared above are the most abundant forms of *C. collina* in Missouri, but other varieties exist, distinguished primarily on leaf shape. Consequently, a key to the varieties of *C. collina*, as well as to some putative interserial hybrids (noted in the key as ISH), is provided here.

KEY TO VARIETIES OF *CRATAEGUS COLLINA* IN MISSOURI AND SOME PUTATIVE INTERSERIAL HYBRIDS RESEMBLING THEM

1a. Styles and nutlets usually 5; upper surface of young leaves generally dense scabrous-pubescent (except *C. collina* var. *sordida*); leaves at flowering time commonly only 1/3–1/2 expanded [*C. collina* varieties] 2

1b. Styles and nutlets usually 2 to 3; surface of young leaves generally subglabrous to only sparsely hairy; leaves at flowering time 1/2 or more expanded [mainly putative hybrids with *C. crus-galli* group] . . 9

2a. Stamens usually 20; leaves lobed or not 3

2b. Stamens 5 to 15(20); leaves evidently lobed . . . . . *C. collina* var. *lettermanii* (Sargent) Eggleston

3a. Anthers white or cream 4

3b. Anthers rose 7

4a. Leaf blades at anthesis mainly broader (1.2–1.6:1) 5

4b. Leaf-blades at anthesis long, narrow (≥ 1.75:1) . . . . . *C. collina* var. *succincta* (Sargent) E. J. Palmer

5a. Lobing of leaf blades evident, but perhaps shallow and irregular; marginal teeth sharp or not 6

5b. Blades ± obovate, not lobed; marginal teeth sharp *C. sucida* Sargent (included in *C. collina* var. *hirtiflora*)

6a. Leaves generally narrower, 1.4–1.6:1, generally widest toward the tip; 1/3–2/3 full grown at anthesis; stamens 20 . . . . . *C. collina* var. *collina*

6b. Leaves broad, 1.3:1 or less; widest in the middle, ± full grown at anthesis; stamens (15 to 20) . . . . . *C. collina* var. *hirtiflora*

7a. Leaf blades at anthesis long, narrow (≥ 1.75:1) *C. angustata* Sargent (included in *C. collina* var. *succincta*)

7b. Leaf blades at anthesis broader than 1.5:1 8

8a. Flowers ≤ 17 mm diam., styles usually 5 . . . . . *C. collina* var. *sordida* (Sargent) Eggleston

8b. Flowers 20–22 mm diam., styles 3 to 5 . . . . . *C. verruculosa* Sargent (ISH)

9a. Stamens 20; veins beneath at most thin-pubescent; inflorescence branches pilose . . . . . *C. collina* var. *collicola* (Ashe) E. J. Palmer (ISH)

9b. Stamens 10 to 15; veins below quite pubescent; inflorescence branches pubescent . . . . . *C. incaedua* Sargent (ISH)

3. Crataegus crus-galli L., Species Plantarum. 1: 476. 1753. TYPE: U.S.A. "Virginiensis," LINN 643.9 (lectotype, designated by Phipps (1988: 364–365), LINN).

3a. Crataegus crus-galli L. var. **regalis** (Beadle) J. B. Phipps, comb. et stat. nov. Basionym: *Crataegus regalis* Beadle, Biltmore Bot. Stud. 1: 134. 1902. TYPE: U.S.A. Georgia: Floyd Co., Rome, 30 Apr. 1900, *C. D. Beadle B2251* (lectotype, designated here, US).

Beadle (1902: 134) did not explicitly cite a type for *Crataegus regalis*, rather he spoke of "original specimens"; the lectotype is an excellent specimen of that mentioned by Beadle in the protologue as coming from the type locality and matches the protologue exactly.

Crataegus crus-galli var. *regalis* is a distinctive variant of *C. crus-galli* that is characterized by often rather large, to 7 cm long, ± elliptic, acute-tipped leaves of a peculiar dark green color and has ± sharp marginal teeth over 1 mm long that are unusually large for members of the *C. crus-galli* complex, with the exception of *C. fecunda*. By contrast, variety *crus-galli* represents the rather variable remainder of the gamut of leaf form found in *C. crus-galli*, i.e.,

lacking the distinctive features of variety *regalis* and occurring throughout the range of the species. The only other variety of *C. crus-galli* that I recognize from Missouri is variety *capillata* Sargent, which is weakly differentiated from the type variety by its sparsely pilose pedicels. *Crataegus crus-galli* var. *regalis* is widely scattered in the south-central part of the species' range from Missouri and Illinois to Georgia and belongs to series *Crus-galli* (Loudon) Rehder.

4. Crataegus pruinosa (H. L. Wendland) K. Koch, Hortus Dendrologicus 168. 1853. Basionym: *Mespilus pruinosa* H. L. Wendland, Flora 14: 710. 1823. TYPE: Germany: Herrenhausen Botanical Garden, nr. Hannover, cultivated, fruiting specimen, 1823, *C. A. Fischer s.n.* (lectotype, designated here, GOET).

Fischer's specimen was located by Jochen Heinrichs, curator of GOET, and is the only known candidate for the type of *Mespilus pruinosa*. Only one fruit is present, from which it is possible to discern at least 15 stamen bases. The lectotype proves to represent a relatively small-leaved, shallowly lobed form of *Crataegus pruinosa*, of the northeastern part of the United States and adjacent Canada, which has often been called variety *parvula* (Sargent) J. B. Phipps.

1a. Crataegus pruinosa (H. L. Wendland) K. Koch var. **magnifolia** (Sargent) J. B. Phipps, stat. nov. Basionym: *Crataegus magnifolia* Sargent, Trees and Shrubs 2: 69. 1908. TYPE: U.S.A. Missouri: Jasper Co., nr. Webb City, 30 Apr. 1905, *E. J. Palmer 26* (lectotype, designated here, A).

Sargent cited *Palmer 26* as the type in his protologue, and this is one of three specimens of that number seen by me at MO. All match the protologue exactly.

Crataegus pruinosa var. *magnifolia* differs from all other varieties of *C. pruinosa* by its very large leaf size (5–7 cm long vs. 3–6 cm in other varieties of *C. pruinosa*) and in its obscure leaf lobing (sharply lobed in other varieties). This is a local, but distinctive, race from southwestern Missouri that has not been seen for many years. *Crataegus pruinosa* var. *magnifolia* belongs to series *Pruinosae* (Sargent) Rehder.

5. Crataegus reverchonii Sargent, Trees and Shrubs II: 55. 1903. TYPE: U.S.A. Texas: Dallas, Apr. 1880, *J. Reverchon 280* (lectotype, designated here, A).

The lectotype is a good-quality flowering specimen matching the protologue precisely.

5a. Crataegus reverchonii Sargent var. **palmeri** (Sargent) J. B. Phipps, comb. et stat. nov. Basionym: *Crataegus palmeri* Sargent, Trees and Shrubs II: 57. 1903. TYPE: U.S.A. Missouri: Jasper Co., Prosperity Jct., Webb City, 6 May 1902, *E. J. Palmer 1a* (lectotype, designated here, A).

Crataegus reverchonii var. *palmeri* is distinguished from variety *reverchonii* by much larger short shoot leaves (4–6 cm vs. 2–3.5 cm long), foliage being dark (not so in type variety), larger flowers (10–12 mm diam. vs. 8–10 mm), greater plant size (6–8 m tall vs. 1–3 m), and style number (2 to 3 vs. 3 to 5). There are no other varieties of *C. reverchonii* that I recognize at present.

Sargent cites six Palmer specimens from Webb County or Carthage, Missouri; none are designated as type in the protologue. From these, I choose for lectotype a high-quality specimen that matches the protologue well.

Crataegus reverchonii var. *palmeri* is effectively a form of *C. reverchonii* that is larger in stature (to 8 m tall vs. 1–3 m), leaf size (4–6 cm long vs. 2–3.5 cm), and flower diameter (10–12 mm vs. 8–10 mm), with fewer styles (2 to 3 vs. 3 to 5) and a mostly allopatric distribution. It also has the characteristic in exsiccatae, when it can be reliably interpreted, of drying a darker color. Whereas *C. reverchonii* var. *reverchonii* is most abundant in Texas and Oklahoma and only just reaches the southwestern corner of Missouri, variety *palmeri* has a wide range through the southeastern quarter of the United States. *Crataegus reverchonii* belongs to series *Crus-galli* (Loudon) Rehder.

6. Crataegus viridis L., Species Plantarum 1: 476. 1753. TYPE: U.S.A. "Virginia," *J. Clayton 526* (lectotype, designated by Eggleston (1908: 83), BM).

6a. Crataegus viridis L. var. **glabriuscula** (Sargent) J. B. Phipps, comb. et stat. nov. Basionym: *Crataegus glabriuscula* Sargent, Bot. Gaz. 31: 235. 1901. TYPE: U.S.A. Texas: Dallas, 15 Apr. 1900, *B. F. Bush 193* (lectotype, designated here, A; duplicate, A).

Sargent cites two specimens in the protologue, one collected by Bush and the other by Reverchon; neither was designated as type. I select the lectotype as being a high-quality specimen that is an excellent match for the protologue. There is also an isolectotype at A. The other syntype for *Crataegus glabriuscula* cited by Sargent (1901: 235) is *J. Reverchon 1* (A), also from Dallas, Texas, July 1899.

Crataegus viridis var. *glabriuscula* has the classic *C. viridis* characteristics of being glabrous in all parts, abaxial leaf vein axils excepted, and having ± eglandular bracteoles, ± entire sepals, 3 to 5 styles and nutlets, and small fruit. It is notable for small, elliptic to nearly suborbiculate, ± unlobed, rather chartaceous leaves with large marginal teeth. By contrast, variety *viridis* has thin, ovate leaves with 1 or 2 sharp lobes per side, generally small marginal teeth, and only 3 lateral veins per side (vs. 4 or 5 in var. *viridis*). Other varieties of *C. viridis* in Missouri are variety *nitens* (Sargent) J. B. Phipps, treated next, variety *ovata* (Sargent) E. J. Palmer, and variety *lanceolata* (Sargent) E. J. Palmer. Both of the latter have essentially unlobed leaves and small leaf teeth; the leaves of variety *ovata* being elliptic-ovate in shape and of variety *lanceolata* lanceolate. *Crataegus viridis* var. *glabriuscula* is generally easily distinguished with good material both in the herbarium and the wild, although a small number of intermediate specimens are found. It occurs exclusively in the southwestern part of the species' range from southwestern Missouri and southeastern Kansas through eastern Oklahoma to central and southern Texas. *Crataegus viridis* var. *glabriuscula* and var. *nitens* belong to series *Virides* (Loudon) Rehder.

6b. Crataegus viridis L. var. **nitens** (Sargent) J. B. Phipps, comb. et stat. nov. Basionym: *Crataegus nitens* Sargent, Rep. (Annual) Missouri Bot. Gard. 22: 76. 1911. TYPE: U.S.A. Missouri: Marion Co., Hannibal, 14 May 1909, *J. Davis 61* (holotype, A).

Sargent's type specimen is an excellent match for the protologue.

Crataegus viridis var. *nitens* also has the classic *C. viridis* characteristics noted under variety *glabriuscula* of being glabrous in all parts, abaxial leaf vein axils excepted, and having ± eglandular bracteoles, ± entire sepals, 3 to 5 styles and nutlets, and small fruit. It is distinguished from variety *viridis* by a short ovate leaf of somewhat coriaceous texture, whereas variety *viridis* has a longer, more narrowly ovate, thin leaf. Compared to variety *glabriuscula*, which also can have shortish, somewhat coriaceous leaves, those of variety *nitens* are generally clearly lobed and have small marginal teeth like those of varities *viridis*, *ovata*, and *lanceolata*. *Crataegus viridis* var. *nitens* is only known from its type area and has not been seen in recent years.

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Literature Cited

Beadle, C. D. 1902. *Crataegus regalis* Beadle *in* Biltmore Bot. Stud. 1: 134.

Eggleston, W. W. 1908. The *Crataegi* of the northeastern United States and adjacent Canada. Rhodora 10: 73–84.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Palmer, E. J. 1925. Synopsis of North American *Crataegi*. J. Arnold Arbor. 6: 5–128.

Phipps, J. B. 1988. Typification of *Crataegus crus-galli* L. (Rosaceae) and nomenclatural notes on some related species of hawthorn. Bot. J. Linn. Soc. 96: 359–369.

———. 2005. A review of hybridization in North American hawthorns—another look at the "*Crataegus* problem." Ann. Missouri Bot. Gard. 92: 113–126.

Sargent, C. S. 1901. *Crataegus glabriuscula* Sargent *in* Bot. Gaz. 31: 335.

———. 1908. *Crataegus* in Missouri. Rep. (Annual) Missouri Bot. Gard. 19: 35–126.

Yatskievych, G. 1999. Steyermark's Flora of Missouri, Vol. 1, Revised Ed. Missouri Department of Conservation, Jefferson City, and Missouri Botanical Garden Press, St. Louis.

———. 2006. Steyermark's Flora of Missouri, Vol. 2, Revised Ed. Missouri Botanical Garden Press, St. Louis, and Missouri Department of Conservation, Jefferson City.

New Species of *Scutellaria* (Lamiaceae) from Mesoamerica

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Abstract. Ten new species of *Scutellaria* L. (Lamiaceae) from Mesoamerica, *Scutellaria albituba* A. Pool, *S. aurantiaca* A. Pool, *S. lactea* A. Pool, *S. molinarum* A. Pool, *S. multiramosa* A. Pool, *S. oblongifolia* A. Pool, *S. saslayensis* A. Pool, *S. talamancana* A. Pool, *S. tucurriquensis* A. Pool, and *S. tutensis* A. Pool, are described and their relationships with allied species are discussed. *Scutellaria oblongifolia* (Panama), and *S. albituba*, *S. lactea*, and *S. talamancana* (Costa Rica) belong to section *Uliginosae* (Epling) Epling and are herbs with small, pallid flowers, the corolla tubes with galeas not exceeding 20 mm in length. *Scutellaria molinarum* (Honduras and Guatemala), in section *Speciosae* (Epling) Epling, is a large herb to 1 m with large reddish purple flowers, the corolla tubes with galea to 26 mm in length. The five remaining new species are members of section *Cardinales* Epling. *Scutellaria multiramosa* (Panama) is a shrub with reddish violet medium-sized flowers, the corolla tubes with galeas 21–27 mm in length. *S. tutensis* (Panama) is a suffruticose herb with large pale lavender flowers, the corolla tubes with galeas to 28 mm in length. *S. saslayensis* (Nicaragua) and *S. tucurriquensis* (Costa Rica) are tall herbs, over 0.5 m tall, with medium to large red flowers, the corolla tubes with galeas 27–29 mm and 21–23 mm, respectively, and *S. aurantiaca* (Honduras) is a tall herb exceeding 0.4 m with orange flowers, the corolla tubes with galeas ca. 32 mm.

Key words: Lamiaceae, Mesoamerica, *Scutellaria*.

Scutellaria L. is a well-defined, sub-cosmopolitan genus in the Lamiaceae with approximately 360 species (Paton, 1990), with 39 species known from Mesoamerica (Pool, in an upcoming volume in the *Flora Mesoamericana* series). The Mesoamerican species, as most species in the genus, are easily recognized by their unusual calyx. The calyx has a short tube and two entire, rounded lips that are equal in length, the upper lip with a transverse sail-like fold, or scutellum. The lips are closed following anthesis, forming a small pouch, until ultimately the lips cleanly separate along sutures to the very base of the calyx, releasing the nutlets. The upper lip is lost while the lower is retained. There is little variation in calyx shape or size in the Mesoamerican species of *Scutellaria*.

The corolla of the Mesoamerican species of *Scutellaria* (and most species in the genus) is also distinctive for the genus. The corolla consists of a long tube with a bi-lipped limb, the lower lip weakly to strongly tri-lobed and the upper lip with two short lateral lobes, and an upper, central lobe, which is more or less strongly galeate, and somewhat bifid. The corolla may be straight at the base of the tube or curved upward, more or less abruptly, a few millimeters above the base. Above this curve, the tube is straight and consistently narrow and cylindrical for a length before expanding, either gradually or abruptly, to the mouth of the tube. This expanded section of the corolla tube may be straight or curved to various degrees. These corolla characteristics, the curving or lack of curving of the tube proximally and/or distally, the length and width of the narrow cylindrical portion of the tube, and the abrupt or gradual expansion to the mouth, have been previously underutilized by investigators of Central American *Scutellaria* (Epling, 1942; Leonard, 1927; Standley & Williams, 1973; Nowicke & Epling, 1969). These characteristics, in addition to corolla length (galea and tube ranging from 1.5 mm to 65 mm) and color (white, yellow, blue, white and blue, blue-purple, red-purple, red-purple and white, red, or orange), are helpful in defining Mesoamerican species. Epling (1942) found the level of insertion of the lower pair of stamens in the corolla tube and the distribution of trichomes within the corolla to be useful species-level characters. In Mesoamerica, the lower of the two pairs of stamens is always inserted at or above the halfway point of the corolla tube, and all but two species (*S. saslayensis* A. Pool and *S. racemosa* Persoon) are similar in the internal corolla trichome distribution: trichomes are found in a wide band in the narrow straight cylindrical portion of the tube, between the proximal curve (when present) and the point at which the corolla expands. In *S. saslayensis*, the corolla is internally glabrous, and in *S. racemosa* trichomes are distributed internally near the base of the tube and on the lip.

Inflorescence characters are useful in delimiting the Mesoamerican species of *Scutellaria*. In some

species, the flowers are exclusively in the axils of leaves, with these leaves similar to the cauline ones to gradually reduced. Most species of Mesoamerican *Scutellaria* have their flowers arranged in terminal, or terminal and axillary, racemes; the lowermost flowers are subtended by reduced leaves and the upper by bracts. The proximal flowers are usually opposite, but the distal flowers can be inserted opposite, alternate and spiraled, or tightly pseudo-whorled, and the flowers can be held erect, spreading, ascending or descending. At anthesis, in Mesoamerican species, the inflorescence is secund and one-sided, except in *S. costaricana* H. Wendland, in which the flowers radiate in all directions in a sub-corymbose raceme. The floral bracts may be sessile or petiolate, caducous or persistent into fruiting, and either appressed to the pedicel or deflexed.

The type, orientation, and length of trichomes found on the inflorescence axis, pedicels, and upper stem internodes are also useful characteristics in *Scutellaria* and were greatly emphasized by Epling (1942). A number of trichome types may be found in any combination in most species; however, the orientation (antrorse vs. retrorse) of the small eglandular trichomes is consistent within a species. In addition, some species of *Scutellaria* (e.g., *S. galerita* Epling and *S. splendens* Link, Klotzsch & Otto) have at least a few gland-tipped patent trichomes always present, while in others they are never found.

Nutlets in Mesoamerican *Scutellaria* can be diverse in surface ornamentation and color, varying from long-pointed papillae with hook-like appendages, to rounded and nearly smooth, and from yellowish brown to black, or sometimes with the papillae of a different color than the background, but unfortunately, the nutlets are rarely retained on herbarium sheets.

Mesoamerican *Scutellaria* vary in habit from woody and greatly branched shrubs to perennial, or rarely, annual herbs. The roots are usually fasciculate and proximally thickened, but can be fibrous or fusiform thickened. The rhizome is often short, thick, and vertical, but in some species (e.g., *S. macer* Epling) is elongate, slender, and horizontal.

Epling's (1942) treatment of the American species of *Scutellaria* is the most recent comprehensive revision to encompass Mesoamerica. In this, he recognizes a number of sections, seven of which apply to Mesoamerican species: *Scutellaria* sect. *Galericularia* A. Hamilton, section *Uliginosae* (Epling) Epling, section *Pallidiflorae* Epling, section *Luteae* Epling, section *Speciosae* (Epling) Epling, section *Cardinales* Epling, and section *Coccineae* Epling. Paton (1990: 426) places these seven sections in synonymy of section *Scutellaria*, but informally recognizes eight species groups that pertain to Mesoamerica: "*S. uliginosa*" (Paton, 1990: 432), "*S. speciosa*" (Paton, 1990: 432), "*S. costaricana*" (Paton, 1990: 433), "*S. coerulea*" (Paton, 1990: 433), "*S. lutea*" (Paton, 1990: 433), "*S. seleriana*" (Paton, 1990: 433), "*S. racemosa*" (Paton, 1990: 436), and "*S. havanensis*" (Paton, 1990: 435). Mesoamerican species with small blue or blue-purple flowers fit into Epling's (1942) *Scutellaria* sect. *Galericularia* (one species, *S. racemosa*) and section *Uliginosae* (17 species). Paton (1990: 436) treats *S. racemosa* in his group "*S. racemosa*" and divides Epling's section *Uliginosae* into his species groups: "*S. uliginosa*" (Paton, 1990: 432), "*S. coerulea*" (Paton, 1990: 433), "*S. seleriana*" (Paton, 1990: 433), and "*S. havanensis*" (Paton, 1990: 435). Members of Paton's (1990) *S. uliginosa* species group are small herbs with a small woody rhizome and small blue, purple or pallid flowers, spirally inserted in a raceme. The new species described herein, *S. albituba* A. Pool, *S. lactea* A. Pool, *S. oblongifolia* A. Pool, and *S. talamancana* A. Pool, fit within Epling's section *Uliginosae* and Paton's *S. uliginosa* species group. The one species from Mesoamerica with white corollas and yellowish green lips (*S. orichalcea* Donnell Smith) is treated by Epling (1942) in section *Pallidiflorae* and probably would fit in Paton's (1990) *S. uliginosa* species group. The only truly yellow-flowered Mesoamerican *Scutellaria* (*S. lutea* Donnell Smith) is treated by Epling (1942) in section *Luteae* and by Paton (1990: 433) in his species group *S. lutea*. Epling (1942) treats Mesoamerican *Scutellaria* species with red, red-purple, or orange flowers as section *Speciosae* (3 species), section *Cardinales* (14 species), and section *Coccineae* (2 species). Members of section *Speciosae* are distinguished as herbs with leaves softly pubescent on both surfaces (Epling, 1942), and the new species, *S. molinarum* A. Pool, fits here. Sections *Cardinales* and *Coccineae* both have leaves with, usually, a few coarse trichomes on the adaxial surface and are hirtellous on abaxial veins, or are glabrous (Epling, 1942). Members of section *Cardinales* are sub-shrubs with the corollas mainly arcuate, while those of section *Coccineae* are herbs with fasciculate, fleshy roots and usually straight corolla tubes (Epling, 1942). The new species *S. aurantiaca* A. Pool, *S. multiramosa* A. Pool, *S. saslayensis*, *S. tucurriquensis* A. Pool, and *S. tutensis* A. Pool fit into Epling's section *Cardinales*. Paton places most species of sections *Speciosae*, *Cardinales*, and *Coccineae* into his species group *S. speciosa*, the members of which are tall herbs or sub-shrubs, with red-colored corollas, the tubes with galeas longer than 2.5 cm, secund in a one-sided inflorescence at anthesis (Paton, 1990: 427, 432), while those with flowers radiating in all directions were placed in his *S. costaricana* species group (Paton, 1990: 433). Harley and Paton (1999)

recognize the section *Speciosae* with reservation, place section *Coccineae* in its synonymy, and suggest that the relationships between sections *Speciosae* and *Cardinales* require further study. While Epling's sections seem unsatisfactory, the informal species groups of Paton (1990) also deserve further refinement. A key to all of the Mesoamerican species of *Scutellaria* will be published by Pool as part of the Lamiaceae in an upcoming volume in the *Flora Mesoamericana* series. Separate keys to species in Epling's (1942) sections or Paton's species groups are impractical here given the uncertainty in defining these groups and, while the new species published herein are organized following Epling's (1942) sections as a practical tool, this is not meant to imply either acceptance or rejection of these sections.

In the following descriptions, the section of the stem described is the internode between the first and second node below the lowest flower. Leaf descriptions are from the leaf at the second node below the lowest flower, excluding those associated with branching; color is the dried condition. Small leafy structures with toothed margins subtending flowers are considered reduced leaves, while those with entire margins are referred to as bracts. Corolla color is as described by collectors as indicated on herbarium labels.

I. Scutellaria sect. **Uliginosae** (Epling) Epling, Lilloa 4: 232. 1939. *Scutellaria* sect. *Heteranthesia* subsect. *Uliginosae* Epling, Repert. Spec. Nov. Regni Veg., Beih. 85: 173. 1936. TYPE SPECIES: *Scutellaria purpurascens* Swartz, Prodr. 89. 1788.

1. Scutellaria albituba A. Pool, sp. nov. TYPE: Costa Rica. Monteverde Reserve, 1500 m, 16 May 1981, *W. Haber 535* (holotype, MO; isotype, CR not seen). Figure 1A.

Species nova *Scutellariae orichalceae* Donnell Smith similis sed ab ea corollae tubo basi stricta cum galea 16–18 mm longo, labio infero atroviolaceo macula alba notato atque foliis lanceolatis differt.

Perennial herbs, 0.3–0.5 m; roots proximally thickened; rhizomes short and vertical with 1 or 2 stems; stems often with several long branches, strongly quadrangular, with rounded angles, pubescent, the indumentum of eglandular trichomes, weakly to strongly antrorse, 0.05–0.25 mm. Leaves 3.5–6.6 × 1.5–3 cm, narrowly lanceolate, membranaceous, olive-green above and grayish or purplish green below, glands ca. 0.05 mm, orange, adaxial blade surface with few trichomes 0.05–0.6 mm, abaxial surface with trichomes 0.05–0.1 mm and dense on veins, sparse or absent on blade surface, the base cuneate or oblique (rarely rounded), the margins serrate to serrulate from apex to 3/4 or more of length, the apex acuminate; petioles (rarely 0.9)1.4–2.5 cm × 0.5–0.75 mm, shorter than adjacent stem internodes. Inflorescence as racemes, 3–8.7 cm, terminal, or terminal and axillary in upper leaf axils, the peduncle 0.5–1.8 cm, flowers at lower nodes subtended by reduced leaves, the inflorescence axis and pedicels pubescent, the trichomes dull white, eglandular, weakly to strongly antrorse, 0.05–0.25 mm, the flowers opposite below, alternate and spiraled above, secund at anthesis, evenly spaced, spreading; bracts strongly deflexed at anthesis, persistent past fruiting, sessile or shortly petiolate, bract blades 3–6 × 0.4–2.25 mm, oblong or lanceolate, the apex rounded or acuminate; pedicels 2.25–3.75 mm, bracteoles near base to 1/3 length from base of pedicel. Flowering calyces 2.75–3 × 2.5–2.75 mm at mouth, pubescent with eglandular trichomes 0.05–0.25 mm, the scutellum 0.5–1 mm high; corolla tube white, lower lip blue or dark bluish purple with white spot in center, tube with galea 16–18 mm, externally pubescent; tube straight and cylindrical at base for 8–10.5 × 1–1.25 mm, pubescent internally, then straight and gradually expanding to 2.5–3.5 mm at mouth; lower lip 3–4.5 mm, parallel to and extending beyond galea, weakly to moderately tri-lobed; upper lip 3–5 mm high, strongly galeate, lateral lobes 1–1.75 mm, acute, upper lobe 1–1.6 mm; lower pair of stamens adnate to corolla tube at 9–11 mm from base, anthers exposed or concealed in the galea. Fruiting calyces 4.5–5.25 mm, the scutellum 4.5–5.5 mm high; nutlets 1.8–2.25 mm, remotely papillate, red-brown; the papillae 0.01–0.05 mm high, broadly conical and apiculate, the papillae and surface between covered with translucent glands.

Distribution. *Scutellaria albituba* has been collected in Costa Rica and Guatemala in forest understory or along forest trails, between 1400 and 1800 m elevation.

Phenology. Collected in flower May, July, November, and December.

Epling (1942), Leonard (1927), and Pool (1998) include this in their concepts of *Scutellaria orichalcea* Donnell Smith. *Scutellaria orichalcea* differs in having corollas totally white or with lips pale yellow or pale green, and corolla tubes relatively longer and narrower (the straight and cylindrical portion of the tube 9–16 × 0.75–1.5 mm), curving strongly upward above base, densely papillate nutlets, and leaves usually oblong with acute apices. Material has also been previously identified as *S. purpurascens* Swartz or *S. breviflora* Bentham, a synonym of *S. purpurascens* (Pool, in an upcoming volume in the *Flora Mesoamer-*

Figure 1. —A. *Scutellaria albituba* A. Pool. Portion of stem with inflorescence and leaves (*W. Haber 535* (MO), holotype). B & C. *Scutellaria lactea* A. Pool. —B. Portion of stem with inflorescence and leaves. —C. Portion of inflorescence. (Both from *J. Utley & K. Utley 3081* (F), holotype).

icana series). *Scutellaria purpurascens* differs in its smaller (tube with galea 11–14 mm) purple corollas, the tube of which curves up strongly proximally, densely papillate nutlets, ovate leaves, and retrorse trichomes on the stem and inflorescence. *Scutellaria albituba* is probably most easily confused with *S. lactea*, described below, which differs in its corolla, which curves upward a few millimeters above the base and has white lips, densely papillate nutlets, and retrorse stem trichomes.

Scutellaria albituba would key to *Scutellaria* sect. *Uliginosae* following Epling (1942).

Paratypes. GUATEMALA. **Quiché:** Cerro Putul, "Zona Reyna," *A. F. Skutch 1828* (F, GH). COSTA RICA. [**Puntarenas**]: Res. Monteverde, vert. Pacifico, filo de Cerro Amigos, *J. J. Dryer 1675* (CR not seen, F, MO); filo al sur del camino, *J. J. Dryer 1303* (CR not seen, F). **Guanacaste:** La Cruz de Abangares, *W. A. Haber & E. Bello C. 2055* (MO).

2. Scutellaria lactea A. Pool, sp. nov. TYPE: Costa Rica. "San José?": San Gerado de Dota, ca. 8–10 km from Interamerican Highway, 18 Sep. 1975, *J. Utley & K. Utley 3081* (holotype, F). Figure 1B, C.

Species nova *Scutellariae orichalceae* Donnell Smith similis sed ab ea corollae tubo ore 3–4 mm diam. cum galea 15–18.5 mm longo, caule trichomatibus retrorsis vestito atque foliis lanceolatis subcoriaceis differt.

Perennial herbs, 0.3–0.6 m; roots proximally thickened; rhizomes short and vertical with 3 stems; stems often with several long branches, strongly quadrangular, pubescent, the indumentum of eglandular trichomes, loosely retrorse, 0.25–0.4 mm, and strongly retrorse, 0.05–0.15 mm. Leaves 3.5–9.5 × 2–4.6 cm, lanceolate, subcoriaceous, dull to dark green above and yellowish green or purple mottled below, glands 0.05–0.15 mm, brown (rarely dull white), adaxial surface with trichomes on midrib ca. 0.05 mm, blade surface nearly glabrous to sparsely pubescent, trichomes 0.03–0.15 mm, abaxial surface with trichomes 0.05–0.25 mm on veins and abundant on blade surface, the base rounded to subcordate, the margins indistinctly serrulate to serrulate from apex to 3/4 or more of length, the apex acuminate to acute; petioles 1.3–3 cm × 0.75–1.5 mm, shorter than adjacent stem internodes. Inflorescence as racemes, 4–8.5 cm, terminal, or terminal and axillary in upper leaf axils, the peduncle 1.3–2 cm, flowers at lower nodes subtended by greatly reduced leaves, the inflorescence axis and pedicels villous, the trichomes dull white, glandular-capitate, patent, 0.25–0.5 mm, or these missing, eglandular, spreading to spreading downward and/or upward, often tangled, 0.05–0.5 mm, the flowers opposite below, subopposite above, secund at anthesis, evenly spaced, erect or ascending; bracts appressed to pedicel to spreading at anthesis, at least some persistent past fruiting, sessile, 2.25–3 × 0.5–1 mm, elliptic, the apex blunt-acuminate; pedicels 3.5–5 mm, bracteoles from near base of pedicel. Flowering calyces 3–3.5 × 3–3.5 mm at mouth, pubescent with eglandular trichomes 0.05–0.1 mm, the scutellum 1.5–2.1 mm high; corolla white or white lightly suffused with purple lines in throat, tube with galea 15–18.5 mm, externally pubescent; tube strongly curved upward at 3–3.5 mm from base, tube above curve straight and cylindrical for 4–6 × 1.25–1.75 mm, pubescent internally, then straight and gradually expanding to 3–4 mm at mouth; lower lip 2.25–6 mm, parallel to and extending beyond galea, strongly tri-lobed; upper lip 2.5–4.5 mm high, weakly galeate, lateral lobes 1–1.25 mm, acute, the upper lobe 1.5–2.5 mm; lower pair of stamens adnate to corolla tube at 8–11 mm from base, anthers concealed in the galea. Fruiting calyces 5–6 mm, the scutellum 4.5–6 mm high; nutlets 1.6–1.9 mm, densely papillate, black, the papillae 0.05–0.1 mm high, broadly conical and apiculate, papillae and surface between with translucent glands.

Distribution. *Scutellaria lactea* is endemic to Costa Rica, found in oak and bamboo forest, between 900 and 2200 m elevation.

Phenology. Collected in flower September and December.

Known from only four collections, two flowering and two fruiting, this has been previously identified as *Scutellaria orichalcea* or *S. purpurascens*. *Scutellaria purpurascens* differs in its leaves, which are membranaceous with cuneate bases, and flowers, which are tightly spiraled in whorl-like groups, the upper subtended by very narrow bracts, with corollas smaller, the tube with galea 11–14 mm long, and more intensely purple colored. *Scutellaria orichalcea* has membranaceous leaves, which are usually oblong and cuneate; corollas longer (the galea with tube 20–25 mm), relatively narrower (cylindrical portion of tube 9–16 × 0.75–1.5 mm and expanded portion of tube 1.5–3.5 mm wide at mouth), and white with greenish white lips; and stem trichomes antrorse and spreading. *Scutellaria lactea* is most similar to *S. albituba*, which differs in its corolla, which is straight at the base and has dark-colored lips, nutlets with remote papillae, and stems with antrorse trichomes.

Scutellaria lactea would key to *Scutellaria* sect. *Uliginosae* following Epling (1942).

Paratypes. COSTA RICA. **San José:** Near Laguna de la Escuadra, NE of El Copey, *P. C. Standley 41989* (US); basin of El General, *A. F. Skutch 4743* (F, MO); Cantón de Pérez Zeledón, R. F. Los Santos, cuenca del Savegre, a orilla de la carretera y márgenes del Río Savegre, *A. Rodríguez, L. D. Vargas & P. Hurtado 3298* (INB not seen, MO).

3. Scutellaria oblongifolia A. Pool, sp. nov. TYPE: Panama. Panamá: Region of Cerro Jefe, ca. 1000 m, 3 Oct. 1969, *M. D. Correa A., R. L. Dressler, N. Escobar & W. H. Lewis 1622* (holotype, MO; isotype, GH). Figure 2A.

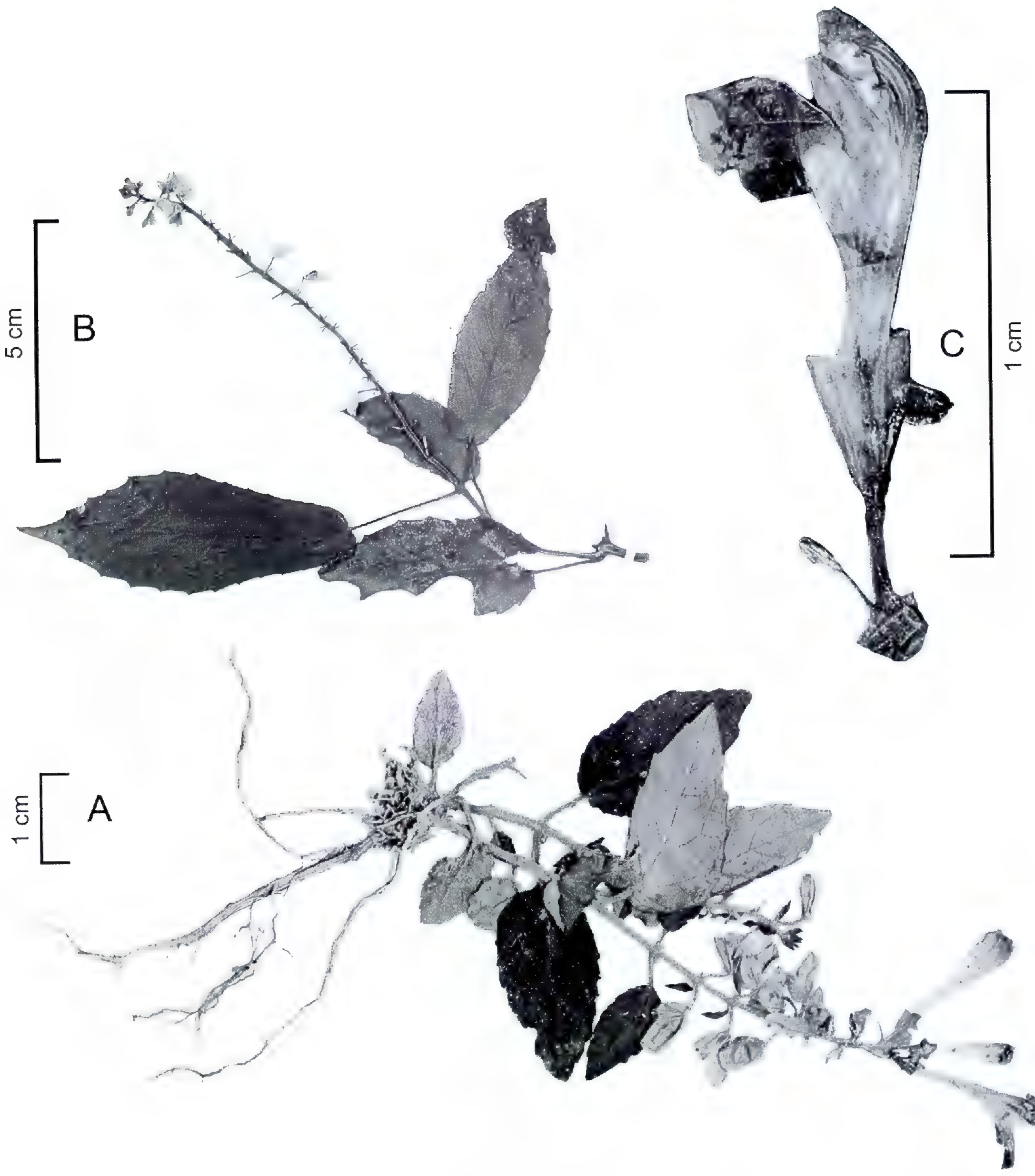

Figure 2. —A. *Scutellaria oblongifolia* A. Pool. Habit (*M. D. Correa A. et al. 1622* (MO), holotype). B & C. *Scutellaria talamancana* A. Pool. —B. Branch with inflorescence and leaves. —C. Flower. (Both from *M. Grayum 10909* (MO), holotype.)

Species nova *Scutellariae tenuipetiolatae* A. Pool similis sed ab ea foliis oblongis basim truncatam vel non profunde cordatam versus valde angustatis, corollae tubo cum galea (15)16–18 mm longo atque nuculis nigris papillis acutis ornatis differt.

Perennial herbs, 0.04–0.2(rarely 0.3) m; roots slightly fusiform; rhizomes short and vertical with 1 to 3 stems; stems not branched or branching from distal nodes, quadrangular, pubescent, the indumentum of eglandular trichomes, strongly retrorse, 0.05–0.3 mm. Leaves 1.8–8.4 × 1–4.6 cm, oblong, membranaceous, blackish green above, dull green below, glands inconspicuous, adaxial blade surface with scattered trichomes, few to numerous, 0.2–0.6 mm, or glabrous, abaxial surface with trichomes 0.02–0.1 mm, dense on veins and dense to few on blade surface, the base markedly narrowed and then truncate or cordate, sinus 0.05–2.5 mm deep, the margins serrulate from apex to 3/4 or more of length, the apex blunt-acute or obtuse; petioles 0.5–2.2 cm × 0.5–1.5 mm, shorter than to equal to adjacent stem internodes. Inflorescence as racemes, 1.7–8.5 cm, terminal, or terminal and axillary

in upper leaf axils, the peduncle 0.6–2.4 cm, sometimes with a pair of reduced leaves along length, the leaves subtending flowers, or not, the inflorescence axis and pedicels pubescent, the trichomes pale brown, glandular-capitate, patent, 0.05–0.1 mm, or these missing, and eglandular, spreading and loosely curving downward, 0.05–0.25 mm, and strongly retrorse, 0.02–0.15 mm, the flowers opposite below, alternate and loosely spiraled above, secund at anthesis, evenly spaced, ascending; bracts appressed to pedicel at anthesis, persistent through fruiting, sessile, 2–3 × 0.5–1.2 mm, elliptic, the apex acute; pedicels 1.25–2 mm, bracteoles at about 1/3 length from base of pedicel. Flowering calyces 2.2–3 × 1.5–2.5 mm at mouth, pubescent with a mixture of glandular-capitate trichomes 0.05–0.1 mm, or these missing, and eglandular trichomes 0.02–0.25 mm, the scutellum 1–1.3 mm high; corolla tube white, lips blue or purple, tube with galea (rarely 15)16–18 mm, externally pubescent; tube strongly curved upward at 2–3 mm from base, tube above curve straight and cylindrical for 4–7.5 × 0.75–1.5 mm, pubescent internally, then straight and abruptly expanding to (rarely 2.5)3.3–4.75 mm at mouth; lower lip 2.5–5.1 mm, parallel to and extending beyond galea, strongly tri-lobed; upper lip 2.5–4 mm high, weakly galeate, lateral lobes 1–2 mm, acute, the upper lobe 1.25–2 mm; lower pair of stamens adnate to corolla tube at 7.5–9.5 mm from base, anthers concealed in the galea or slightly exposed. Fruiting calyces 4.5–5 mm, the scutellum 4.5–5 mm high; nutlets (rarely 1.5 mm, perhaps immature) 1.75–2 mm, moderately to abundantly papillate, black, the papillae ca. 0.05 mm high, narrowly to broadly conical and apiculate, crowned by a translucent gland, the papillae and surface between covered with translucent glands.

Distribution. *Scutellaria oblongifolia* is endemic to Panama, mainly in the vicinity of Cerro Jefe, and is found in tropical wet forests, between 30 and 1000 m elevation.

Phenology. Collected in flower January, March, April–June, August, October, and November.

Specimens of *Scutellaria oblongifolia* have been previously identified as *S. purpurascens*, which differs most markedly in its ovate leaves with shortly cuneate leaf bases and dark purple corollas (the tube with galea 11–15 mm long) that gradually expand above the narrow cylindrical part of the tube. *Scutellaria oblongifolia* appears to be most similar to *S. tenuipetiolata* A. Pool. *Scutellaria tenuipetiolata* differs from *S. oblongifolia* in leaf shape, ovate with cordate base (vs. oblong with the base markedly narrowed and then truncate or cordate); smaller corollas (tube with galea 12–16 mm or rarely 16.5 mm long); and the nutlet color and ornamentation, light to medium red-brown and remotely papillate to nearly smooth.

Scutellaria oblongifolia would key to *Scutellaria* sect. *Uliginosae* following Epling (1942).

Paratypes. PANAMA. **Panamá:** on rd. near slopes of Cerro Jefe, *T. M. Antonio, H. E. Moore & F. E. Putz 3430* (MO); Cerro Jefe, 6 mi. past Cerro Azul on rd. to Altos Pacora, *K. Sytsma & W. G. D'Arcy 3684* (MO); forest & path, Finca Indio beside Río Cascadas, *W. G. & J. J. D'Arcy 6236* (MO); Finca El Indio, at headwaters of Río Indio, slopes of Cerro Jefe, *T. Antonio 2429* (MO); Cerro Jefe area, near Altos de Pacora, *W. G. D'Arcy & K. Sytsma 11739* (MO); vic. of Cerro Jefe, Altas de Pacora, *T. Antonio 3219* (MO); Gorgas Memorial Labs yellow fever res. camp, ca. 25 km NE of Cerro Azul on Río Piedras, *S. Mori & J. Kallunki 3368* (MO); Altos del Río Pacora, *W. H. Lewis, B. MacBride & R. Solís 2303* (MO). **Colón:** Along Río Escandaloso near Mina Boquerón, Número 2, above Río Boquerón, *T. Antonio 1311* (MO, NY). **Comarca de San Blas:** Río Taindi, 6 km above confluence with Río Mandinga, *G. de Nevers & H. Herrera 7653* (MO); Cerro Brewster, headwaters of Río Cangandí, *G. de Nevers, H. Herrera, B. Hammel & S. Charnley 5512* (MO); Río Cangandí, pueblo Cangandí, camino nuevo hacia Mandi Yala, *H. Herrera 160* (MO).

Scutellaria oblongifolia fits within Epling's (1942) delimitation of *Scutellaria* sect. *Uliginosae* and within this group is associated with the Mesoamerican species *S. galerita* and *S. tenuipetiolata* and the South American species *S. leucantha* Loesener, all of which differ from other members of this section in having corollas that expand abruptly from the top of the narrow cylindrical portion of the tube to the mouth. This corolla type is beautifully illustrated for *S. tenuipetiolata* by J. Myers in Pool (1998). A key to the members of this group is presented below.

KEY TO *SCUTELLARIA* SPECIES IN SECTION *ULIGINOSAE* (TROPICAL AMERICA) WITH COROLLA TUBES THAT EXPAND ABRUPTLY ABOVE THE NARROW CYLINDRICAL PORTION OF THE TUBE TO COROLLA MOUTH

1a. Floral bracts widely elliptic, length less than 2 times width; nutlets pale greenish yellow to pale yellow-brown (Peru, Brazil) . . . . . *S. leucantha*

1b. Floral bracts narrowly elliptic, length more than 2 times width; nutlets reddish brown to black (Central America).

2a. Floral bracts deflexed; scutellum 1.5–2.1 mm high (Nicaragua, Costa Rica) . . . . . *S. galerita*

2b. Floral bracts appressed to spreading parallel to pedicels; scutellum 0.6–1.3 mm high.

3a. Leaves oblong, markedly narrowed at base; galea and tube (rarely 15)16–18 mm long; nutlets black, moderately to abundantly papillate; stem trichomes strongly retrorse . . . . . *S. oblongifolia*

3b. Leaves ovate, not markedly narrowed at base; galea and tube 12–16.5 mm long; nutlets reddish brown, remotely papillate to nearly smooth; stem trichomes spreading to downward curving . . . *S. tenuipetiolata*

4. Scutellaria talamancana A. Pool, sp. nov. TYPE: Costa Rica. Limón: Cantón de Limón, Cordillera de Talamanca, along divide betw. Río Xikiari & Río Boyei above Cabécar village of Almirante, 9°46′30″N, 83°20′00″W, 1100–1150 m, 13 Aug. 1995, *M. Grayum 10909* (holotype, MO; isotype, INB not seen). Figure 2B, C.

Haec species quoad habitum et corollae formam ad *Scutellariam purpurascentem* Swartz accedit, sed ab ea foliis 7.2–11 cm longis oblongo- vel elliptico-subpanduriformibus, corolla pallida ca. 10 mm longa atque nuculis 2.2–2.5 mm longis revera differt.

Perennial herbs, 0.25–0.5 m; roots proximally thickened; rhizomes short and vertical with 1 or 2 stems; branches developing from previous season's distal nodes, branches strongly quadrangular, angles rounded, puberulent, the indumentum of eglandular trichomes, spreading, or very slightly curving downward at tips, 0.02–0.03 mm, with a few trichomes to 0.05 mm. Leaves 7.2–11 × 3–5.5 cm, elliptic- or oblong-subpandurate, membranaceous, both surfaces light green, but darker above, glands inconspicuous, adaxial blade surface glabrous except for at or near margins, trichomes 0.1–0.25 mm, abaxial surface with trichomes 0.02–0.03 mm on veins and blade surface, or blade surface glabrous, the base deeply cordate, sinus 3–5 mm deep, the margins serrate from apex to 3/4 or more of length, the apex acuminate-caudate; petioles 2–3 cm × 0.8–1 mm, shorter (or rarely longer) than adjacent stem internodes. Inflorescence as racemes, 1.8–3.5 cm, terminal, or terminal and axillary in upper leaf axils, the peduncle 0.4–1.4 cm, flowers at lower nodes sometimes subtended by reduced leaves, the inflorescence axis and pedicels puberulent, the trichomes dull white, eglandular, spreading, 0.02–0.03 mm, the flowers opposite to subopposite below or all alternate and spiraled, appearing secund at anthesis, evenly spaced, spreading; bracts appressed to pedicel at base then spreading perpendicular to inflorescence axis at anthesis, persistent past fruiting, sessile, 2.25–2.75 × 0.5 mm, oblong, the apex acute to rounded; pedicels 2–2.25 mm, bracteoles near 1/3 length from base of pedicel. Flowering calyces 3–3.1 × ca. 2 mm at mouth, pubescent with eglandular trichomes 0.01–0.03 mm, or occasionally with longer trichomes to 0.1 mm at apex, the scutellum 1.1–1.25 mm high; corolla tube color not indicated by collector, assumed to be greenish white, upper lip greenish white, lower lip violet, tube with galea 10–10.3 mm, externally pubescent; tube slightly to strongly curved upward at 2.5–3 mm from base, above curve straight and cylindrical for 1.5–1.75 × 1 mm, pubescent internally, then straight and gradually expanding to 2 mm at mouth; lower lip 3–3.25 mm, deflexed and extending beyond galea, strongly tri-lobed; upper lip 2.75–3 mm high, weakly galeate, lateral lobes 1.1–1.25 mm, acute to acuminate, the upper lobe 1.5–1.75 mm; lower pair of stamens adnate to corolla tube at 5.5–6 mm from base, anthers slightly exposed or concealed in the galea. Fruiting calyces ca. 4.75 mm, the scutellum ca. 4.5 mm high; nutlets 2.2–2.5 mm, remotely papillate, light red-brown; the papillae ca. 0.05 mm high, conical and apiculate, the papillae and surface between covered with translucent glands.

Distribution. *Scutellaria talamancana* is known only from the type locality in Costa Rica.

Phenology. Collected in flower in August.

Scutellaria talamancana is unusual in its combination of very small flowers (tube with galea 10–10.3 mm) and large (7.2–11 cm) subpandurate leaves. It is one of only four species in Mesoamerica with corollas (tube with galea) smaller than 12 mm long, the others being *S. racemosa* (4.5–6 mm), *S. gaumeri* Leonard (10–13 mm), and *S. purpurascens* (11–14 mm), all of which are quite different from *S. talamancana*. *Scutellaria racemosa* has fibrous roots, elongate rhizomes, small hastate leaves (0.75–2.9 cm), and flowers solitary in the leaf axils. *Scutellaria gaumeri* has ovate to deltate leaves, flowers opposite in the axils of long-petiolate bracts, and nutlet papillae that are topped with a peltate scale. *Scutellaria purpurascens* has ovate leaves, which are basally rounded or truncate and then shortly cuneate, apical flowers tightly spiraled in whorl-like clusters, corollas purple, and nutlets 1–1.9 mm long. Five additional Mesoamerican species, *S. costaricana*, *S. ebracteata* A. Pool, *S. glabra* Leonard, *S. hookeri* Epling, and *S. tucurriquensis* A. Pool, have leaves of similar shape to those of *S. talamancana*, but they have much larger (tube with galea 19–65 mm) corollas, which are red, red-orange, red-purple, rose, or lavender.

Scutellaria talamancana would key to *Scutellaria* sect. *Uliginosae* following Epling (1942).

II. Scutellaria sect. **Speciosae** (Epling) Epling, Lilloa 4: 258. 1939. *Scutellaria* sect. *Heteranthesia* subsect. *Speciosae* Epling, Repert. Spec. Nov. Regni Veg., Beih. 85: 174. 1936. TYPE SPECIES: *Scutellaria ventenatii* Hooker, Bot. Mag. 72: t. 4271. 1846.

1. Scutellaria molinarum A. Pool, sp. nov. TYPE: Guatemala. Chiquimula: betw. Guatemala-Honduras border & Atulapa, 900 m, 9 Dec. 1969, *A. Molina R. & A. R. Molina 25271* (holotype, EAP; isotypes, F, MO, NY, US). Figure 3A.

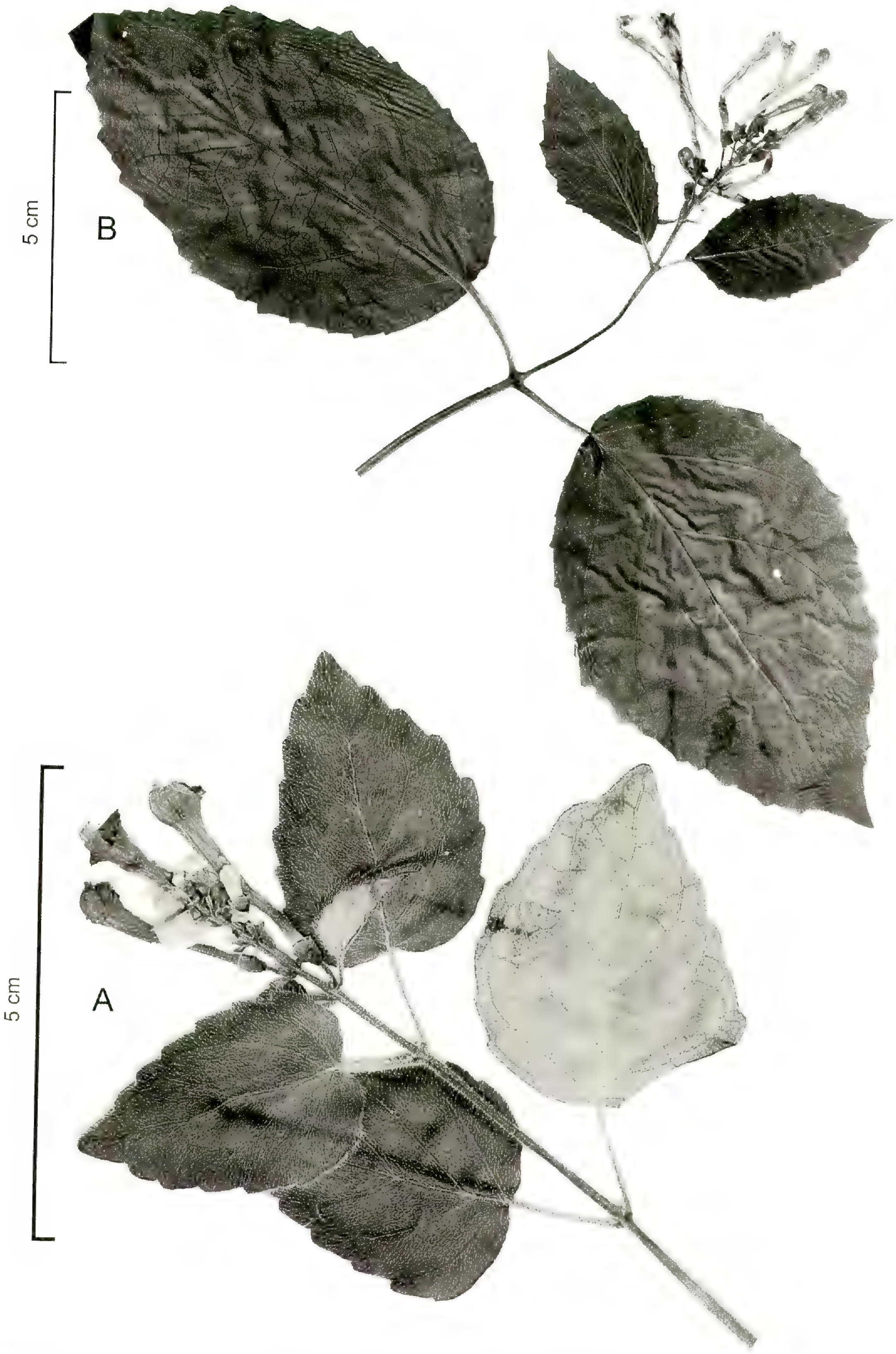

Figure 3. — A. *Scutellaria molinarum* A. Pool. Portion of branch with inflorescence and leaves (*L. Molina R. & L. R. Molina 25271* (EAP), holotype). — B. *Scutellaria aurantiaca* A. Pool. Portion of stem with inflorescence and leaves (*J. Saunders 1111* (NY), holotype).

Species nova *Scutellariae guatemalensi* Leonard similis sed ab ea corollae tubo cum galea 22–26 mm longo, bracteis patentibus (non deflexis) atque foliorum base rotundata deinde interdum ad cuneata petiolo 0.7–2.8 cm longo differt.

Perennial herbs, 0.5–1 m; roots proximally thickened; rhizomes short and vertical with several stems; stems branching, branches often short with few leaves and terminating with raceme, rounded-quadrangular, pilose, the indumentum of a mixture of glandular-capitate patent trichomes, 0.15–0.5 mm, or these missing, and a mixture of spreading long and short eglandular trichomes 0.25–1.5 mm and 0.05–0.1 mm, respectively. Leaves 2–4.4 × 1.7–3.6 cm, ovate, membranaceous to subcoriaceous, dark olive green above and pale yellowish gray-green or purplish below, glands inconspicuous, adaxial blade surface with abundant to dense (rarely sparse) trichomes, 0.1–2 mm, abaxial surface with trichomes 0.1–1.3 mm, dense to abundant on veins and blade surface, sometimes sparse on blade surface, the base rounded to rounded and then shortly cuneate, the margins serrulate to serrate (rarely crenulate) from apex to 2/3 or 3/4 or more of length, the apex acute to obtuse; petioles 0.7–2.8 cm × 0.5–0.75 mm, shorter than to longer than adjacent stem internodes. Inflorescence as racemes, 0.9–11 cm, terminal, or terminal and axillary in upper leaf axils, the peduncle 0.5–4 cm, flowers at lower nodes subtended by reduced leaves, the inflorescence axis and pedicels velutinous, the trichomes dull white, a mixture of glandular-capitate, these patent, 0.1–0.3 mm, and a mixture of spreading long and short eglandular trichomes, 0.25–1 mm and 0.05–0.1 mm, respectively, the flowers opposite below, sometimes alternate above, secund at anthesis, evenly spaced, erect to steeply ascending; bracts spreading perpendicular to inflorescence axis (rarely appressed to pedicels at base), persistent past fruiting, sessile, 1–2.5 × 0.4–0.75 mm, oblong to narrowly elliptic, the apex rounded; pedicels 2.5–3 mm, bracteoles near base to 1/3 length from base of pedicel. Flowering calyces 2.75–3.1 × 2.3–2.75 mm at mouth, pubescent with glandular-capitate trichomes 0.15–0.25 mm, or these missing, and eglandular trichomes 0.025–0.25 mm, the scutellum 0.75–1.1 mm high; corolla magenta or rose-orchid (rarely described on herbarium labels as lavender or crimson), tube with galea 22–26 mm, externally pubescent; tube slightly curving upward at 2.75–3.5 mm from base, above curve straight and cylindrical for 2.5–6 × 1–1.75 mm, pubescent internally, then straight and gradually expanding to 3.2–5 mm at mouth; lower lip 2.5–6 mm, parallel to and extending beyond galea, strongly tri-lobed; upper lip 3.25–6 mm high, strongly galeate, lateral lobes 1.1–2 mm, rounded, the upper lobe 1.5–2 mm; lower pair of stamens adnate to corolla tube at 12–17 mm from base, anthers concealed in the galea. Fruiting calyces 5–6 mm, the scutellum 5–6 mm high; nutlets 1.5–2.2 mm, densely papillate, dark reddish brown, or darker between papillae, papillae 0.03–0.05 mm high, conical and obtuse, papillae and surface between with translucent glands.

Distribution. *Scutellaria molinarum* is found near the southern sector of the border between Guatemala and Honduras, in pine or pine-oak forests, between 900 and 2400 m elevation.

Phenology. Collected in flower January, May, October, and December.

The one specimen of *Scutellaria molinarum* known to have been seen by Epling (*Steyermark 42472*, F) was identified by him as *S. seleriana* Loesener. *Scutellaria seleriana* differs from *S. molinarum* in its floral bracts, which are broadly ovate or orbicular and long-petiolate, the straight and cylindrical portion of the corolla tubes relatively narrow (6–10.5 × 0.6–1.5 mm); nutlet papillae, which are crowned by a peltate-stellate scale, the arms of which hook downward; and the stem pubescence, which includes small retrorse trichomes. *Scutellaria molinarum* is most similar to *S. guatemalensis* Leonard, which has smaller corollas (tube with galea 12–16 mm); nutlets with broader papillae that are stout, thick, and apically depressed, contrasting greatly in color with background nutlet surface; petioles generally shorter (0.3–1 cm); and subcordate to cordate leaves. Specimens of *S. molinarum* have also been identified as *S. purpurascens*, which differs in its smaller purple corollas (tube with galea 11–14 mm), flowers arranged in approximate whorls, and the indumentum of the stem and inflorescence axis with retrorse, eglandular trichomes, with no glandular-capitate trichomes present.

Scutellaria molinarum would key to *Scutellaria* sect. *Speciosae* following Epling (1942).

Scutellaria molinarum is named in honor of Honduran botanists Antonio Molina R. and his wife, Albertina R. de Molina, who collected several specimens of this new species, including its type, and have contributed vastly to our knowledge of the Honduran flora.

Paratypes. GUATEMALA. **Chiquimula:** Montaña Castilla, vic. of Montaña Cebollas, along Río Lucía Saso, 3 mi. SE of Quezaltepeque, *J. A. Steyermark 31348* (F). **Zacapa:** Upper slopes Sierra de las Minas, along Río Repollal to mtn. summit, *J. A. Steyermark 42472* (F, US). HONDURAS. **Ocotepeque:** Hillsides of Machuca, Honduras & Guatemala border, *A. Molina R. & A. R. Molina 27861* (EAP, F); ca. 8 km SW of Santa Fé near Guatemala border, *A. Molina R., L. O. Williams, A. R. Molina, T. P. Williams & J. A. Molina 31274* (EAP). **Lempira:** Montaña de Celaque, river banks of

Quebrada Naranja above la planta (electrica) above Villa Verde, 7.5 km SW of Gracias, *W. G. D'Arcy 17862* (EAP).

III. Scutellaria sect. **Cardinales** Epling, Lilloa 4: 263. 1939. TYPE SPECIES: *Scutellaria longifolia* Bentham, in Lindley, Edwards's Bot. Reg. 18: sub t. 1493. 1832.

1. Scutellaria aurantiaca A. Pool, sp. nov. TYPE: Honduras. Gracias a Dios: 3 hr. walk NW from camp, mountain peak, Camp Tiro, 2 mi. NW of Bulebar on third branch of Quebrada Tiro, tributary of Río Plátano, 15 43′N, 84 50′W, 1500–2200 ft., 25 Mar. 1981, *J. Saunders 1114* (holotype, NY). Figure 3B.

Species nova *Scutellariae lundellii* Epling et *S. longifoliae* Bentham similis sed ab eis habitu herbacea erecta pauciramos atque inflorescentia minore bracteis persistentibus munita differt.

Tall herbs, taller than 0.4 m, the total height not indicated on herbarium label; lower parts not seen; stem little branching above, weakly quadrangular with rounded edges, minutely densely pubescent, indumentum of eglandular trichomes, weakly to strongly antrorse, 0.05–0.2 mm. Leaves 9.2–9.1 × 3.2–5.9 cm, widely elliptic-lanceolate, brownish green above and below, glands inconspicuous, adaxial surface with few trichomes scattered on blade surface, 0.2–0.5 mm, abaxial surface and veins with dense trichomes, trichomes on veins 0.05–0.15 mm, trichomes on blade surface 0.025–0.05 mm, the base rounded, the margins serrate from apex to 3/4 or more of length, the apex acute to short-acuminate; petioles 1.5–1.8 cm × 0.75–1.25 mm, much shorter than adjacent stem internode. Inflorescence as racemes, ca. 3 cm, terminal, peduncle ca. 4.5 cm with a pair of reduced leaves near apex, the inflorescence axis and pedicels densely pubescent, the trichomes dull white, eglandular, weakly to strongly antrorse, 0.05–0.25 mm, the flowers opposite below, alternate and spiraling above, secund at anthesis, evenly spaced, erect to spreading-ascending; bracts deflexed at anthesis, persistent at least through flowering, sessile, 2.5–3.5 × 0.4–0.6 mm, narrowly oblanceolate, the apex blunt-acute; pedicels 3.5–4.1 mm, bracteoles 1/3 to 1/2 length from base of pedicel. Flowering calyces 3–3.25 × 2.25–2.5 mm at mouth, densely pubescent, eglandular trichomes 0.05–0.2 mm, the scutellum 1.25–1.5 mm high; corolla bright red-orange, tube with galea 32 mm, externally pubescent; tube slightly curving upward at 2.25–3 mm from base, above curve straight and cylindrical for ca. 8 × ca. 1.25 mm, pubescent internally, then straight and gradually expanding to ca. 4 mm at mouth; lower lip ca. 4 mm, parallel to galea, strongly tri-lobed; upper lip ca. 5.1 mm high, the lateral lobes ca. 1.5 mm, rounded, the upper lobe ca. 2.5 mm; lower pair of stamens adnate to corolla tube at ca. 18 mm from base, anthers concealed in the galea. Fruiting calyces not seen; nutlets not seen.

Distribution. *Scutellaria aurantiaca* is known only from the type locality in Honduras.

Phenology. Collected in flower in March.

This unusual species is most similar to *Scutellaria lundellii* Epling and *S. longifolia* Bentham, both of which differ from *S. aurantiaca* in being abundantly branched shrubs, or suffrutex, with elongated inflorescences, 6.5–25 cm long, the bracts of which are lost prior to anthesis. In addition, *S. lundellii* has smaller (2.5–7 × 1.4–3.5 cm), usually oblong, leaves serrate only in the apical 1/2 to 2/3, and petioles less than to 1 cm long. *Scutellaria longifolia* is less pubescent than *S. aurantiaca*; it has smaller trichomes (0.01–0.05 mm) on the stem and inflorescence axis and fewer trichomes on the abaxial leaf surface, its leaves are long-acuminate and generally falcate, and its corollas expand abruptly then gradually above the narrow base.

Scutellaria aurantiaca would key to *Scutellaria* sect. *Cardinales* following Epling (1942).

2. Scutellaria multiramosa A. Pool, sp. nov. TYPE: Panama. Chiriquí: Cerro Colorado, along rd. to old copper mine development N of San Félix, 18.6 mi. N of bridge over river near San Félix, 6.6 mi. beyond Chamé & rd. to Escopeta, 8 30′N, 81 46′W, 1175–1485 m, 30 Mar. 1993, *T. B. Croat 74999* (holotype, MO; isotype, MEXU). Figure 4A.

Species nova *Scutellariae isocheilae* Donnell Smith similis sed ab ea habitu fruticoso ligneo ramosissimo, bracteis parvulis latis ad pedicellos adpressis aque scutello 0.50–0.75 mm alto differt.

Shrubs, 1–1.5 m; lower parts not seen; stem abundantly branching above, quadrangular, pubescent, the indumentum of eglandular trichomes spreading to strongly antrorse, 0.1–0.5 mm. Leaves 2.5–5.2 × 1–1.8 cm, elliptic to nearly oblong, membranaceous, dark green above, similar below or slightly lighter, glands ca. 0.1 mm, dark reddish brown, adaxial blade surface glabrous or with trichomes 0.05–0.1 mm on main veins, abaxial blade surface glabrous or with trichomes 0.025–0.05 mm evenly distributed overall with trichomes on venation 0.05–0.1 mm, the base attenuate to cuneate or rounded, usually unequally so, the margins serrulate from apex to 1/2 to 2/3 of length, the apex acute to acuminate; petioles 0.8–1.5 cm × 0.5–0.75 mm,

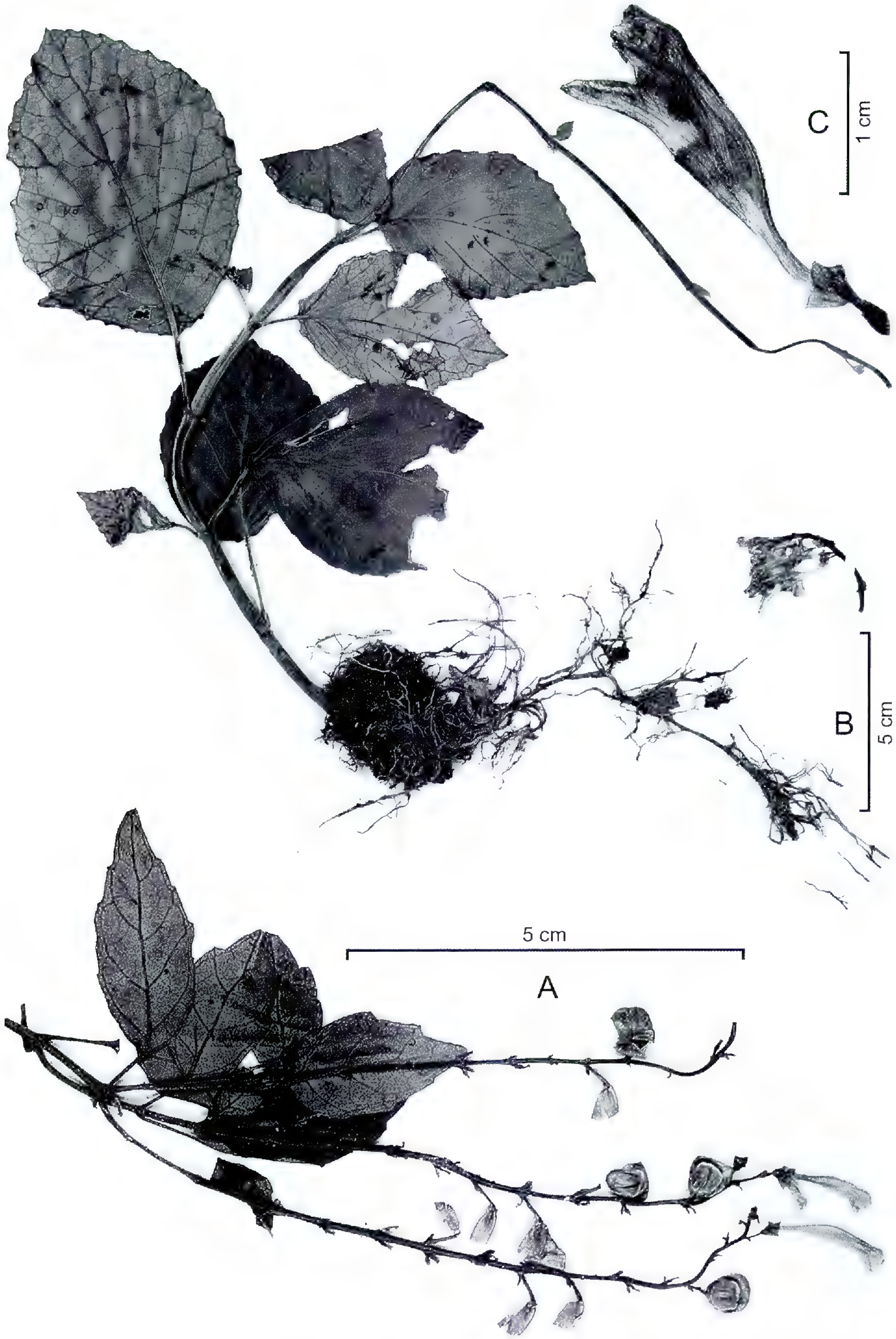

Figure 4. —A. *Scutellaria multiramosa* A. Pool. Portion of branch with inflorescence and leaves (*T. B. Croat 74999* (MO), holotype). B & C. *Scutellaria saslayensis* A. Pool. —B. Habit, apex of inflorescence broken and reversed. —C. Flower. (Both from *A. J. Ferguson 2* (MO), holotype.)

equal to or shorter than adjacent stem internode. Inflorescence as racemes, 5.2–11 cm, terminal and often appearing axillary, but terminal on very short branches, the peduncle 0.2–1.5 cm, often with 1 or 2 pairs of reduced leaves starting 1/2 of length from base with flowers developing from axils, the inflorescence axis and pedicels densely pubescent, the trichomes reddish purple to brown, eglandular, weakly antrorse, 0.1–0.2 mm, the flowers opposite-decussate below to spiraling alternate above, secund at anthesis, evenly spaced, erect; bracts appressed to pedicel, generally persistent in fruit, sessile, 0.6–1.75 × 0.45–1 mm, widely elliptic, the apex rounded; pedicels 1.75–3 mm, bracteoles near 1/2 length from base of pedicel. Flowering calyces 2.5–4.5 × 1.8–2.25 mm at mouth, scarcely pubescent on margins and sometimes on upper lip, with glandular-capitate trichomes 0.05–0.1 mm, and eglandular trichomes ca. 0.025 mm, the scutellum 0.5–0.75 mm high; corolla reddish violet with lip white to light pink, tube with galea 21–27 mm, externally pubescent; tube curving upward at 2–3.2 mm from base, above curve straight and cylindrical for 1.25–3.5 × 1.25–2.5 mm, pubescent internally, then slightly curving and gradually expanding to 3–5.5 mm at mouth; lower lip 3.25–5 mm, slightly curving downward and extending slightly beyond galea, moderately tri-lobed; upper lip 1–1.75 mm high, weakly galeate, the lateral lobes 1.25–1.5 mm, obtuse, the upper lobe 1–1.5 mm; lower pair of stamens adnate to corolla tube at ca. 12 mm from base, anthers concealed in the galea. Fruiting calyces 3.5–4.75 mm, the scutellum 3.5–4 mm high; nutlets ca. 2 mm, remotely papillate, reddish brown with pale brown papillae, the papillae 0.03–0.05 mm high, cylindrical to narrowly conical and apically truncate with caducous apical gland.

Distribution. *Scutellaria multiramosa* is endemic to Panama, where it is found in the vicinities of Cerro Colorado and Cerro Tute, growing in cloud forest, between 1450 and 1500 m elevation.

Phenology. Collected in flower March, June, and July.

Specimens of *Scutellaria multiramosa* have been previously identified as *S. leucisiana* Nowicke, a synonym of *S. isocheila* Donnell Smith (Pool, in an upcoming volume in the *Flora Mesoamericana* series). *Scutellaria isocheila* differs in being a woody-based herb, less branched, with spreading bracts, longer and relatively narrower (2.5–6 × 0.5–1.5 mm, the length more than 3 times the width vs. *S. multiramosa*, 0.6–1.75 × 0.45–1 mm, the length less than 3 times the width), longer pedicels (3–5 mm), and higher scutellum in flower (1.25–2 mm).

Scutellaria multiramosa would key to *Scutellaria* sect. *Cardinales* following Epling (1942).

Paratypes. PANAMA. **Chiriquí:** Cerro Colorado, near Continental Divide, *T. Antonio 1507* (MO). **Bocas del Toro:** 12 mi. beyond camp. Chamé, "12 + 12 mi." from río San Félix, *W. G. D'Arcy 16275* (MEXU, MO); Cerro Colorado, 9.2 mi. W of Chamé, along trail E of rd. to stream, *T. B. Croat 69061* (MO). **Veraguas:** Cerro Tute, ca. 10 km NW of Santa Fé, on ridge top in cloud forest, *S. Mori 6770* (MO).

3. Scutellaria saslayensis A. Pool, sp. nov. TYPE: Nicaragua. Zelaya: Cerro Saslaya, a unos 25 km al oeste de Siuna, 1200 m, Oct. 1977, *A. J. Ferguson 2* (holotype, MO; isotype, HNMN not seen). Figure 1B, C.

Species nova *Scutellariae ebracteatae* A. Pool similis sed ab ea corolla rubra e basi ca. 3 mm argute sursum flexa ac supra tubum angustum orem versus abrupte expansa, foliis late ellipticis atque caule trichomatibus retrorsis vestito differt.

Perennial herbs, 0.4–1 m; roots fibrous; rhizomes short, thick and horizontal with 2 stems; stems not branching, rounded to quadrangular, minutely pubescent, the indumentum of eglandular trichomes, weakly retrorse, 0.2–0.25 mm, and strongly retrorse, 0.025–0.15 mm. Leaves 6–13.5 × 1–6.5 cm, widely elliptic, subcoriaceous, dark green above, yellow-green below, glands ca. 0.05 mm, orange, adaxial blade surface glabrous, abaxial surface with trichomes 0.05–0.2 mm on main veins, and scattered on blade surface, ca. 0.025 mm, the base narrowed then unequally rounded to cordate, sinus to 3 mm deep, the margins serrulate to serrate from apex to 3/4 or more of length, the apex short-acute to obtuse; petioles 1.5–3.5 cm × 1–1.5 mm, shorter than adjacent stem internodes. Inflorescence as racemes, 20–26.5 cm, terminal, peduncle 10.5–19 cm, with 2 pairs of reduced leaves at or above 1/3 length, the inflorescence axis and pedicels pubescent, the trichomes dull white to brown septate, eglandular, spreading or weakly retrorse, 0.15–0.3 mm, and strongly retrorse, 0.025–0.05 mm, the flowers opposite below, alternate and spiraling above, secund at anthesis, evenly spaced, the inflorescence curving downward but flowers spreading upward; bracts lost prior to anthesis, petiolate, bract blades 1.5–5.5 × 1.5–1.7 mm, lanceolate, the apex attenuate-acute; pedicels 2.5–3 mm, bracteoles not seen. Flowering calyces 3–3.75 × 2.5–3.25 mm at mouth, pubescent, with eglandular trichomes 0.025–0.05 mm, the scutellum 1.5–1.75 mm high; corolla red, tube with galea 27–29 mm, externally pubescent; tube sharply curving upward at 2.75–3 mm from base, above curve straight and cylindrical for 6–7 × ca. 1 mm,

glabrous internally, then gently curving and abruptly expanding to 5.5 mm at mouth; lower lip 5.5–6 mm, more or less parallel to and extending beyond galea, weakly tri-lobed; upper lip 5.5–7 mm high, weakly galeate, the lateral lobes 1–1.75 mm, obtuse, the upper lobe 1–2 mm; lower pair of stamens adnate to corolla tube at ca. 16 mm from base, anthers concealed in the galea. Fruiting calyces not seen; nutlets not seen.

Distribution. *Scutellaria saslayensis* is known from two collections made in the cloud forests of Cerro Saslaya, Nicaragua, between 1100 and 1400 m elevation.

Phenology. Collected in bud in May, in flower in October.

Pool (1998) included the specimens of *Scutellaria saslayensis* in *S. ebracteata*, which differs in its red-purple corollas that are straight at the base and abruptly then gradually expand above the narrow cylindrical portion of the tube to the mouth, its narrower oblanceolate to elliptic leaves, and its antrorse trichomes on the stem and inflorescence.

Scutellaria saslayensis would key to *Scutellaria* sect. *Cardinales* following Epling (1942).

Paratype. NICARAGUA. **Zelaya:** Cerro Saslaya, 20 km W of Siuna, cloud forest, along E mtn. ridge, *D. A. Neill 1832* (MO).

4. Scutellaria tucurriquensis A. Pool, sp. nov. TYPE: Costa Rica. Cartago: Turrialba, along trail to river in back of main building, Inter-Amer. Inst. of Agric. Sci., 13 July 1955, *B. G. Schubert & D. L. Rogerson 841* (holotype, A). Figure 5A, B.

Species nova *Scutellariae glabrae* Leonard similis sed ab ea caule dense pubescenti atque corolla sine dente basali differt.

Tall herbs, taller than 0.5 m, the total height not indicated on herbarium labels; lower parts not seen; stem not branching above, weakly quadrangular with rounded edges, minutely densely pubescent, indumentum of eglandular trichomes, weakly to strongly antrorse, 0.025–0.05 mm. Leaves 9–12.5 × 4–4.6 cm, elliptic to slightly subpandurate, membranaceous, green above, slightly paler green below, glands inconspicuous, adaxial blade surface glabrous or with very few trichomes scattered on surface, 0.1–0.3 mm, abaxial blade surface and veins with scattered trichomes, ca. 0.025 mm, the base narrowed then subcordate to cordate, sinus 1–3 mm deep, the margins serrate from apex to 3/4 or more of length, the apex acuminate and falcate; petioles 1.3–3 cm × 1–1.5 mm, much shorter than adjacent stem internode. Inflorescence as racemes, 8–27 cm, terminal, peduncle 1.5–3.5 cm, sometimes with a pair of reduced leaves at 2/3 of length, the inflorescence axis and pedicels densely pubescent, the trichomes dull white to pale brown, eglandular, weakly to strongly antrorse, 0.025–0.1 mm, the flowers opposite below, alternate and spiraling above, often in groups of 4, secund at anthesis, evenly spaced, spreading; bracts strongly deflexed at anthesis if present, lost at anthesis or during flowering, sessile, 1.5–2.5 × 0.3–0.7 mm, linear, the apex acute to truncate; pedicels 3.5–4.5 mm, bracteoles near base of pedicel. Flowering calyces 3.25–4 × 2.1–2.25 mm at mouth, nearly glabrous to densely pubescent, eglandular trichomes 0.025–0.05 mm, the scutellum 1.5–2 mm high; corolla scarlet, tube with galea 21–23 mm, nearly glabrous; tube strongly curving upward at 3.5–5 mm from base, above curve straight and cylindrical for 3.5–4.5 × 1 mm, pubescent internally, then gently curving and abruptly then gradually expanding to 3.5–4 mm at mouth; lower lip 2.5–3.5 mm, parallel to galea, weakly tri-lobed; upper lip 3–4.1 mm high, strongly galeate, the lateral lobes 1–1.25 mm, acute, the upper lobe 1.25–2 mm; lower pair of stamens adnate to corolla tube at 16.5–17 mm from base, anthers concealed in the galea. Fruiting calyces not seen; nutlets not seen.

Distribution. *Scutellaria tucurriquensis* is endemic to Cartago, Costa Rica, in the vicinity of Tucurrique, where it is found growing along rivers, between 600 and 800 m elevation.

Phenology. Collected in flower May and June.

Scutellaria tucurriquensis is similar to *S. glabra* and *S. ebracteata*. *Scutellaria glabra* differs in its corolla tube having a large saccate tooth near its base and glabrous stems and abaxial leaf surfaces. *Scutellaria ebracteata* differs in its pendulous flowers, with longer (tube with galea 27–32 mm) reddish purple corollas, straight at the base and widening to 4.5–6 mm at mouth. Epling (1942) cites *S. longifolia* from Costa Rica based on *Donnell Smith 6700* (US), treated here as *S. tucurriquensis*. *Scutellaria longifolia* differs from *S. tucurriquensis* in its lanceolate leaves with bases rounded to cuneate or attenuate, and orange-red corollas, which are 27–33 mm long, and straight (or nearly so) at the base and above the narrow cylindrical portion of the tube.

Scutellaria tucurriquensis would key to *Scutellaria* sect. *Cardinales* following Epling (1942).

Paratypes. COSTA RICA. **Cartago:** S bank of Río Pejivalle, *C. W. Dodge & W. S. Thomas 4398* (GH, MO); Atirro, *J. Donnell Smith 6700* (GH, US); Inst. Turrialba, *J. León 2521* (EAP).

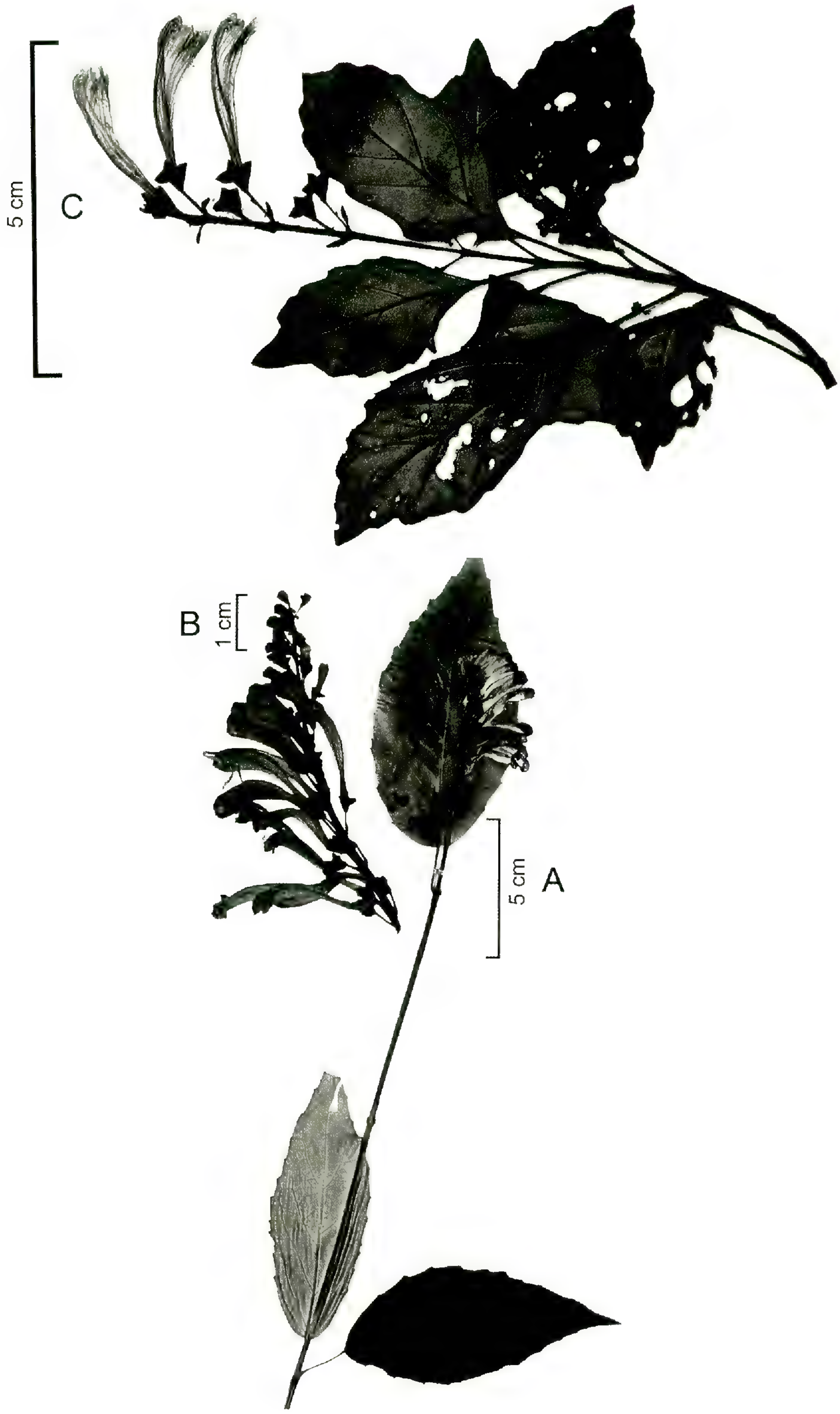

Figure 5. A & B. *Scutellaria tucurriquensis* A. Pool. —A. Portion of stem with inflorescence and leaves (*B. G. Schubert & D. L. Rogerson 841* (A), holotype). —B. Portion of inflorescence (*J. León 2521* (EAP), paratype). —C. *Scutellaria tutensis* A. Pool. Portion of branch with inflorescence and leaves. (*K. Sytsma & L. Andersson 4589* (MO), holotype).

5. Scutellaria tutensis A. Pool, sp. nov. TYPE: Panama. Veraguas: Cerro Tute, E slopes, 1 km beyond Escuela Agrícola Alto de Piedra above Santa Fé, 1200–1450 m, 14 May 1981, *K. Sytsma & L. Andersson 4589* (holotype, MO). Figure 5C.

Species nova *Scutellariae isocheilae* Donnell Smith similis sed ab ea bracteis ad pedicellos elongatos adpressis, inflorescentia trichomatibus capitato-glanduliferis vestita atque corolla dilute caesia differt.

Suffruticose herbs, taller than 0.3 m, the total height not indicated on herbarium labels; lower parts not seen; often with a number of branches in upper portion, strongly quadrangular, minutely pubescent, the indumentum of eglandular trichomes spreading, 0.025–0.1 mm. Leaves 3.2–6.6 × 1.7–2.6 cm, oblanceolate to rhombic, subcoriaceous to membranaceous, dark green above, yellowish green below, glands ca. 0.05 mm, orange, blade glabrous on both surfaces, the base unequally cuneate to attenuate, the margins serrate from apex to 2/3 of length, the apex acute; petioles 1–2 cm × 0.6–0.9 mm, longer than adjacent stem internodes. Inflorescence as racemes, 4.2–6.2 cm, terminal, peduncle 2.5–2.7 cm, often with 1 pair of reduced leaves at 1/2 to 2/3 length, the inflorescence axis and pedicels pubescent, the trichomes colorless except for brown septa, a mixture of glandular-capitate, these patent, 0.25–0.4 mm, and eglandular and spreading, 0.025–0.1 mm, the flowers opposite below, alternate and spiraling above, secund at anthesis, evenly spaced, spreading; bracts appressed to pedicels at anthesis, persistent through flowering, sessile, the blades 3–4 × 0.75–0.9 mm, linear, the apex rounded; pedicels 6–6.5 mm, bracteoles at 1/2 length from base of pedicel. Flowering calyces 4–5 × 3.6–4 mm at mouth, pubescent, glandular-capitate trichomes on margin, ca. 0.1 mm, eglandular trichomes on surface, 0.025–0.05 mm, the scutellum 2–2.25 mm high; corolla pale lavender with white lips, tube with galea 26–28 mm, externally pubescent; tube straight and cylindrical at base for 5–6 × 1.5–1.75 mm, short-pubescent internally, then gently curving and gradually expanding to 5–6.2 mm at mouth; lower lip 3.5–5 mm, parallel to and expanding beyond the galea, weakly tri-lobed; upper lip 4.3–4.5 mm high, weakly galeate, the lateral lobes ca. 1.75 mm, obtuse, the upper lobe 1–1.8 mm; lower pair of stamens adnate to corolla tube at ca. 17 mm from base, anthers concealed in the galea. Fruiting calyces not seen; nutlets not seen.

Distribution. *Scutellaria tutensis* is known from one flowering specimen (holotype) and one further specimen with the remains of a postmature inflorescence, both from Cerro Tute in Panama, where they were collected in wet premontane to low cloud forest, between 1200 and 1400 m elevation.

Phenology. Collected in flower in May.

Scutellaria tutensis is most similar to *S. isocheila*. *Scutellaria isocheila* differs from *S. tutensis* in its smaller pedicels, 3–5 mm long, floral bracts spreading to deflexed, eglandular trichomes, and corolla tube usually magenta or fuchsia, or rarely, lavender. *Scutellaria lewisiana*, treated as a synonym of *S. isocheila* (Pool, in an upcoming volume in the *Flora Mesoamericana* series), was described by Nowicke (1969) as having pedicels 4–6 mm long and the corollas lavender; however, on the holotype (*J. H. Kirkbride & J. A. Duke*, MO) and isotype (NY) the pedicels are not longer than 5 mm, and the dried corollas are much darker colored than the dried corollas of *S. tutensis*.

Scutellaria tutensis would key to *Scutellaria* sect. *Cardinales* following Epling (1942).

Paratype. PANAMA. **Veraguas:** Ridge of Cordillera de Tute, trail to Cerro Tute, above escuela agrícola Alto de Piedra, just W of Santa Fé, *S. Knapp & R. Dressler 5404* (MO).

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Literature Cited

Epling, C. 1942. The American species of *Scutellaria*. Univ. Calif. Publ. Bot. 20: 1–146.

Harley, R. & A. Paton. 1999. Notes on New World *Scutellaria*. Kew Bull. 54: 221–225.

Leonard, E. 1927. The North American species of *Scutellaria*. Contr. U.S. Natl. Herb. 22: 703–748.

Nowicke, J. W. 1969. Two new species from Panama. Phytologia 18: 419–420.

——— & C. C. Epling. 1969. Part IX. Family 169. Labiatae. *In* R. E. Woodson, Jr., & R. W. Schery (editors), Flora of Panama. Ann. Missouri Bot. Gard. 56: 71–111.

Paton, A. 1990. A global taxonomic investigation of *Scutellaria*. Kew Bull. 45: 399–450.

Pool, A. 1998. Notes on Central American *Scutellaria* (Lamiaceae). Novon 8: 62–66.

Standley, P. C. & L. O. Williams. 1973. Labiatae. *In* Flora of Guatemala. Fieldiana, Bot. 24(9): 237–317.

A New Species and Conservation Status of *Schindleria* (Phytolaccaceae) from Peru

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Abstract. *Schindleria* (Phytolaccaceae) is a small genus of only three species from Peru and Bolivia. Routine identification of recent Peruvian collections has revealed a new species. *Schindleria tomentosa* Ricketson is described and illustrated, and its conservation status (CRB1D) and phylogenetic relationships are discussed. In addition, three synonyms are lectotypified (*Rivina densiflora* Kuntze var. *flavida* Kuntze, *S. weberbaueri* O. C. Schmidt, and *S. glabra* H. Walter), and a fourth synonym (*Villamilla rosea*) is deemed illegitimate.

Resumen. El género *Schindleria* (Phytolaccaceae) contiene solamente tres especies provenientes del Perú y Bolivia. Durante el transcurso de identificar colecciones peruanas se descubrió una especie nueva para la ciencia. Se describe e ilustre *Schindleria tomentosa* Ricketson y se discute su estado de conservación parentezco. Además, se lectotipifica tres sinónimos (*Rivina densiflora* Kuntze var. *flavida* Kuntze, *S. weberbaueri* O. C. Schmidt y *S. glabra* H. Walter), y se determine que otro sinónimo (*Villamilla rosea*) es ilegítimo.

Key words: Bolivia, Cusco, IUCN Conservation Status (CRB1D), Peru, Phytolaccaceae, *Schindleria*.

Schindleria H. Walter (Phytolaccaceae) is a small genus of only three species from Peru and Bolivia. The genus was named for Anton Karl Schindler (1879–1964), a German botanist who worked alongside Hans Walter at Halle. Schindler was a fellow contributor to Engler's *Das Pflanzenreich* and provided the treatment of the Halorrhagaceae. The genus *Schindleria* is defined by its semi-shrubby nature, mostly erect racemes, with a single floral bract and two minute bracteoles, perfect actinomorphic flowers, four tepals with usually three parallel veins, many stamens (12 to 25), one-carpellate ovary, and an utricle type of fruit.

Hans Walter (1906) described the genus, *Schindleria*, containing four species: *S. glabra* H. Walter, *S. racemosa* (Britton) H. Walter, *S. rivinoides* (Rusby) H. Walter, and *S. rosea* (Rusby) H. Walter, with no indication of the type species for the genus. Three additional species were added between 1909 and 1952: Walter (1909) described *S. mollis* H. Walter, Schmidt (1923) described *S. weberbaueri* O. C. Schmidt, and Monachino (1952) transferred *Rivina densiflora* Kuntze [= *S. densiflora* (Kuntze) Monachino]. Joan Nowicke (1969) presented the last complete treatment for the genus and reduced it to two species: *Schindleria densiflora* (including as synonyms *S. rosea*, *S. rivinoides*, and *S. weberbaueri*) and *S. racemosa* (including as synonyms *S. glabra* and *S. mollis*). She provided the following key to the species (Nowicke, 1969: 337):

a. Plants turning black or brown-black upon desiccation . . . . . 1. *S. racemosa*
aa. Plants remaining green or turning yellow upon desiccation. . . . . 2. *S. densiflora*

Although the above key has proven workable in the past, it is unclear how useful it is in the field with fresh material. The addition of a third species has now made the above key out of date. Thus a new key is presented here.

Key to the Species of *Schindleria*

1a. Filaments 3.8–4 mm long; inflorescence densely tomentose; tepals tomentellous abaxially. . . . . 3. *S. tomentosa*
1b. Filaments less than 2 mm long; inflorescence glabrous to densely tomentose; tepals glabrous abaxially.
2a. Abaxial leaf surface tomentellous to densely tomentose along the veins; plants turning black or brown-black upon desiccation . . . . . 2. *S. racemosa*
2b. Abaxial leaf surface scattered to densely puberulent along the veins; plants remaining green or turning yellow upon desiccation . . . . . 1. *S. densiflora*

Nowicke (1969) briefly reviewed the nomenclature of the genus and the species. However, some additional clarification is needed, and three of the synonyms are still in need of lectotypification.

Schindleria H. Walter, Bot. Jahrb. Syst. 37(Beibl. 85): 24. 1906. TYPE. Bolivia. Yungas, 1890, *M. Bang 414* (lectotype, designated by Nowicke (1969: 337–338), MO; isotypes, F, NY [2], US [3]).

1. Schindleria densiflora (Kuntze) Monachino, Phytologia 4: 39. 1952. Basionym: *Rivina densiflora* Kuntze var. *subrosa* Kuntze, Revis. Gen. Pl. 3(3): 268. 1898. TYPE: Bolivia. Santa Rosa, 2000 m, 1 Apr. 1892, *O. Kuntze s.n.* (lectotype, designated by Monachino (1952: 40), NY).

Rivina densiflora Kuntze var. *flavida* Kuntze, Revis. Gen. Pl. 3(3): 268. 1898. TYPE: Bolivia. Tunari, 2300 m, 4 May 1892, *O. Kuntze s.n.* (lectotype, designated here, NY).

Villamilla rivinioides Rusby, Bull. New York Bot. Gard. 4: 436. 1907. *Schindleria rivinoides* (Rusby) H. Walter, Bot. Jahrb. Syst. 37(Beibl. 85): 24. 1906. TYPE: Bolivia. Sine loc., s.d., *M. Bang 2607* (lectotype, designated by Nowicke (1969: 338), MO; isotypes, F, GH, NY [2], US [2]).

Schindleria weberbaueri O. C. Schmidt, Notizbl. Bot. Gard. Berlin-Dahlem 8: 313. 1923. TYPE: Peru. Huanuco: Prov. Huanuco, Tal des Mayro, ca. 10° S. Br., im immergrünen Buschwald, 400–500 m, July 1913, *A. Weberbauer 6758* (lectotype, designated here, F; isotype, GH).

Kuntze (1898) listed both variety *subrosa* and variety *flavida* as parts of his new taxon *Rivina densiflora*. Monachino (1952) designated the *R. densiflora* var. *subrosa* material as the lectotype for his new combination, *Schindleria densiflora*. Although the NY sheets are not clearly labeled as types, his publication specifically designates the Santa Rosa collection by Kuntze from Bolivia as the lectotype. With the lectotypification of the variety *subrosa* material, variety *flavida* becomes a synonym of *S. densiflora*. As stated above, Kuntze did not specify where this material was located; thus I hereby designate the NY collection of *Kuntze s.n.* from Tunari, Bolivia, as the lectotype for *R. densiflora* var. *flavida*.

Rusby (1907) designated the *M. Bang 2607* collection as the type of *Villamilla rivinioides* Rusby; however, he failed to designate where his type was deposited. Although it is generally assumed that the type is at NY, that material is not clearly marked; thus Nowicke (1969: 338) designated the MO sheet as the lectotype.

In Otto Schmidt's (1923) original description of *Schindleria weberbaueri*, the only material he lists is the *A. Weberbauer 6758* collection, although he did not designate where his type was located. It can be assumed that Schmidt may have had a sheet at B, since that is where he worked and the original description came out in a Berlin Garden publication. However, any material that was at B was destroyed in 1943, thus necessitating the need to select a lectotype. Although Nowicke (1969: 338) apparently studied a number of sheets ("F, GH, MO, NY"), she did not select a lectotype. Searches of the MO and NY herbaria have failed to discover this material. However, the F and GH sheets are present, and the F sheet is hereby designated as the lectotype.

A brief note is in order regarding the status of the specific epithet of *Schindleria rosea*, because this name has been continuously used in the literature. Walter (1906: 24) based his new combination, *S. rosea*, on "*Villamilla rosea* Rusby! Exsicc. Boliv. Bang. n. 1292." As stated by Monachino (1952: 39), "the name was based on a cheironym ... the name appears merely on the label of the herbarium sheet *Bang 1292*." However, because the basionym is nomen nudum any further combination is nomen illegitimum unless published with a valid description. Walter (1909), Heimerl (1934), Monachino (1952), and Nowicke (1969) all perpetuated the name without recognizing the problem, nor did they publish the name with a valid description. The name *S. rosea* is thus illegitimate and has no further standing, because the *Bang 1292* collection is clearly a specimen of *S. densiflora*. Additional confusion has occurred because Rusby (1896) published the new combination *V. rosea-oenia* (Lemaire) Rusby [= *Ladenbergia rosea-oenia* Lemaire = *Trichostigma peruvianum* (Moquin) H. Walter], based on a misidentification of the *Bang 1292* collection.

2. Schindleria racemosa (Britton ex Rusby) H. Walter, Bot. Jahrb. Syst. 37(Beibl. 85): 24. 1906. Basionym: *Villamilla racemosa* Britton ex Rusby, Mem. Torrey Bot. Club 4(3–4): 251. 1895. TYPE: Bolivia. Yungas, 1890, *M. Bang 414* (lectotype, designated by Nowicke (1969: 338), MO; isotypes, F, NY [2], PH not seen, US [3]).

Schindleria glabra H. Walter, Bot. Jahrb. Syst. 37(Beibl. 85): 24. 1906. TYPE: Peru. Sandia: Chunchusmayo, im Wald, 900 m, s.d., *A. Weberbauer 1168* (lectotype, designated here, Pflanzenr. IV. 83(Heft 39): 115, Fig. 33. 1909).

Schindleria mollis H. Walter, Pflanzenr. IV. 83(Heft 39): 116. 1909. TYPE: Bolivia. Ohne Standortsangabe [without indication of location], s.d., *W. Lobb 691* (holotype, W not seen; isotype, W photo [F neg. 29998] at MO).

Two collections, *M. Bang 414* and *H. Rusby 743*, are listed in the original description of *Villamilla racemosa* and are thus syntypes to one another. Although Britton and Rusby's types are generally considered to be at NY, neither specified where the types were deposited. Nowicke (1969) lectotypified the taxon with the *M. Bang 414* collection based on the MO specimen. Nowicke (1969) also designated the *M. Bang 414* material as the type for the genus, which had not previously been done.

In Walter's (1906) original description for the type of *Schindleria glabra*, he did not list where this type

was deposited. However, in Walter's (1909) treatment for *Das Pflanzenreich*, he does list a sheet from B, which unfortunately was destroyed in 1943. It appears that the *A. Weberbauer 1168* collection was a unicate. Searches of herbaria known to house specimens of Dr. August Weberbauer have failed to locate a duplicate of the collection. However, figure 33 on page 115 of Walter's (1909) treatment in Engler's *Das Pflanzenreich* is a drawing of the *A. Weberbauer 1168* collection. The same drawing appears in Heimerl (1934) and is referenced by Macbride (1936). With no specimen to choose from, I hereby designate the drawing in *Das Pflanzenreich* IV. 83(Heft 39): 115. fig. 33. 1909, as the lectotype.

The only known specimen of *Schindleria mollis* is the holotype at W, which I have not seen. However, based on a photograph (F neg. 29998) of the holotype at MO, it does appear that Nowicke (1969) was correct to place this taxon in synonymy under *S. racemosa*.

3. Schindleria tomentosa Ricketson, sp. nov. TYPE: Peru. Cusco: Urubamba, Dist. Machu Picchú, Troche Iran Bingham, 13 09'S, 072 13'W, 2207 m, 20 May 2003, *I. Huamantupa, J. Farfán, G. Huallparimachi 3267* (holotype, MO; isotypes, CUZ, F, FTG, K, NY, US). Figure 1.

Haec species ob corpus plantae viride vel flavoviride in sicco *S. densiflorae* similis, sed ab ea ramulis, venis abaxialibus, costis superioribusque rhachidibus inflorescentiarum dense tomentosis (non tomentellis usque dense puberulis) tepalis subter villosis (non glabris), laminis 3.2–12.1 × 0.9–4.7 cm (non 20 × 7 cm), petiolis 0.5–2.1 cm (non 7–9 cm), pedicellis 2.8–3.9 mm (non 7–9 mm) longis, tepalis 1.1–1.3 mm (non 2–3 mm) longis, denique filamentis 3.8–4 mm (non 1–1.5 mm) longis perfacile recognoscitur.

Liana or *semi-shrub*, 3–4 m tall; branchlets slender, terete, 3–4 mm diam., densely stalked-stellate and multi-armed dendritic-tomentose. *Leaves* with blades membranous, elliptic to elliptic-ovate, 3.2–12.1 × 0.8–4.7 cm, apically acute to acuminate, the acumen 0.4–1.7 cm long, basally acute to obtuse, adaxially tomentellous, except tomentose along the midrib, abaxially densely tomentose, especially along the midrib and secondary veins, the midrib impressed above, prominently raised abaxially, the secondary veins 8 to 15 pairs, impressed adaxially, prominently raised abaxially, the margins entire to shallowly irregularly crenate or erose; petioles slender, marginate, 0.5–2.1 cm long, densely tomentose. *Inflorescences* densely tomentose throughout, the lateral racemes 8–23 × 1–2.7 cm, erect, columnar, longer than the leaves, the rachis, 75- to 125-flowered; peduncles 1.7–4.2 cm long; floral bracts usually deciduous, membranous, acicular, 1.8–2.7 × 0.1–0.4 mm, apically acuminate, glabrous adaxially, barely to notably tomentellous abaxially, the veins inconspicuous, the margins entire; pedicels slender, terete, 3.4–7.1 mm long, densely tomentose; bracteoles 2, along the pedicel, membranous, persistent, ovate, ca. 0.2 × 0.2 mm, apically acute to short-acuminate, the margins entire, glabrous, usually buried in the tomentum of the pedicels; pedicels slender, terete, 2.8–3.9 mm long. *Flowers* 4-merous; tepals white, free, membranous, oblanceolate to spathulate, 1.1–1.3 × 1.6–1.7 mm, apically rounded, erose, 3-veined, glabrous adaxially, scattered villous abaxially, with scattered dendritic trichomes, the margins entire to slightly erose apically; stamens 18 to 25, membranous, 4–4.4 mm long, the filaments filiform, 3.8–4 × 0.08–0.12 mm, glabrous, the anthers white, erect, basifixed, thecae linear, separated except in the middle at the connective, 1.1–1.2 × 0.2–0.3 mm, apically and basally separated; each sac rounded on either end, glabrous, usually deciduous after anthesis; pistil 1-carpellate, 1.6–1.7 mm long, the ovary 1-locular, 1-seeded, compressed laterally and ridged along the edge, ovoid, 0.8–1 mm diam., the walls thin and transparent, the style absent or short-sessile, the stigma penicellate with many stigmas. *Fruit* an utricle, ovoid, compressed laterally and ridged or winged along the edge, thin walled, transparent, 1.3–1.9 mm diam., glabrous, often with scattered villous trichomes along the apical margins, the seeds brown to black.

Distribution and phenology. *Schindleria tomentosa* is known from the Department of Cusco, Peru, in the provinces of La Convención and Urubamba. It grows between 2200 and 2800 m elevation. Flowering March to September; fruiting May to September.

Ecology and conservation status. This species was collected in montane, primary and secondary wet forests in Peru. At this time, the IUCN designation for its conservation status is Critically Endangered: CRB1D (IUCN, 2001), because we know of only six localities over an area less than 100 km^2. However, Luis Valenzuela (pers. comm.) estimates that each locality contains several individuals (perhaps 3 to 5) and that the populations appear to be spreading. It is believed that continued collecting in the region will locate additional sites, and the conservation status may need to be adjusted in the future.

Schindleria tomentosa is one of three species in the genus. The species is unique because the vestiture covering the branchlets and leaves, especially along the veins, petioles, rachis, and pedicels, is dense-tomentose and the indumentum is composed of stalked stellate and multi-armed dendritic trichomes.

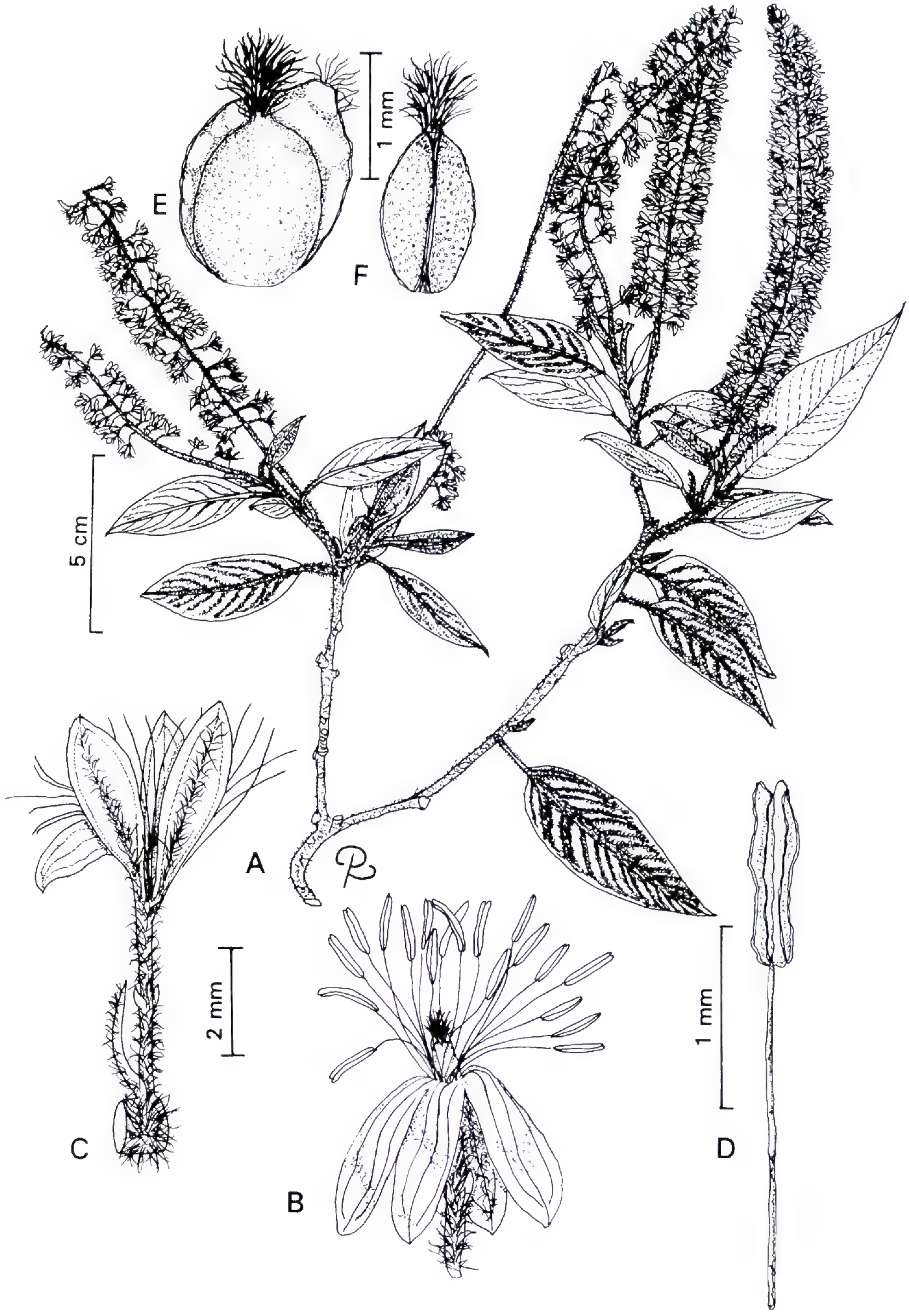

Figure 1. *Schindleria tomentosa* Ricketson. —A. Flowering branch. —B. Flower at anthesis. —C. Flower after anthesis showing floral bract and bracteoles. —D. Detail of stamen, showing anther after anthesis and upper portion of filament. —E. Fruit, face view. —F. Fruit, lateral view. A–F drawn from the holotype, *I. Huamantupa et al. 3267* (MO).

The vestiture of the pedicels and abaxial surface of the tepals is villous, of simple multicellular trichomes. The tepals are 4.1–4.3 mm long, and the filaments are 3.8–4 mm long.

The vestiture of *Schindleria racemosa* is sparse to scattered-villous on the branchlets, abaxial leaf surface, and rachis and dense only along the midribs of the abaxial leaf surface; the indumentum is of

simple multicellular trichomes. The pedicels and tepals are glabrous. The tepals are 2–3.5 mm long, and the filaments are 1.2–2 mm long.

The vestiture of *Schindleria densiflora* is sparse to densely puberulent on the branchlets, the veins of the abaxial leaf surface, and the midrib of the adaxial leaf surface and rachis. The pedicels and tepals are glabrous. The tepals are 2–3 mm long, and the filaments are 1–1.5 mm long.

Paratypes. PERU. **Cusco:** Prov. La Convención, Dist. Santa Ana, Poromate, *G. Calatayud et al. 1536* (AMAZ not seen, CUZ not seen, HUT not seen, MO, MOL not seen, NY, TEX, US, USM not seen); Prov. La Convención, Dist. Santa Ana, Tunquimayo, *E. Sudli & I. Chama 99* (AMAZ not seen, CUZ not seen, HUT not seen, LPB, MEXU, MO, USM not seen, W); *G. Calatayud et al. 2722* (B, CUZ not seen, F, MO); Prov. La Convención, Dist. Santa Ana, Subcuenca Chuyapi, Poromate, *L. Valenzuela et al. 179* (AMAZ not seen, CUZ not seen, ETG, G, GH, HUT not seen, MO, MOL not seen, USM not seen); Prov. La Convención, Dist. Santa Teresa, Yerbabuenayoc, *I. Huamantupa & I. Huamantupa 1305* (CUZ not seen, MO); Prov. Urubamba, Dist. Machu Picchú, *L. Valenzuela et al. 1730* (AMAZ not seen, CUZ not seen, F, FTG, HUT not seen, K, MO, MOL not seen, USM not seen).

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Literature Cited

Heimerl, A. 1934. Phytolaccaceae. Pp. 135–164 *in* A. Engler & K. Prantl (editors), Nat. Pflanzenfam., ed. 2, vol. 16c. Wilhelm Engelmann, Leipzig.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Kuntze, O. 1898. Revis. Gen. Pl. 3(3): 1–576.

Macbride, J. F. 1936. Phytolaccaceae. Pp. 540–558 *in* Flora of Peru. Publ. Field Mus. Nat. Hist., Bot. Ser. 13.

Monachino, J. V. 1952. A new combination in *Schindleria*. Phytologia 4: 39–41.

Nowicke, J. W. 1969. Palynotaxonomic study of the Phytolaccaceae. Ann. Missouri Bot. Gard. 55: 294–363.

Rusby, H. H. 1896. An enumeration of the plants collected in Bolivia by Miguel Bang. III. Mem. Torrey Bot. Club 6(1): 1–130.

———. 1907. An enumeration of the plants collected in Bolivia by Miguel Bang, Part 1. With descriptions of new genera and species. Bull. New York Bot. Gard. 4(14): 309–479.

Schmidt, O. C. 1923. Drei neue Phytolaccaceen aus Südamerika. Notizbl. Bot. Gart. Berlin-Dahlem 8: 312–314.

Walter, H. 1906. Die Diagramme der Phytolaccaceen. Bot. Jahrb. Syst. 37(Beib. 85): 1–57.

———. 1909. Phytolaccaceae. Pp. 1–151 *in* A. Engler (editor), Das Pflanzenreich IV. 83(Heft 39).

A New Species of *Ludia* (Salicaceae) from Madagascar's Eastern Littoral Forest

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Abstract. Recent collecting efforts in Madagascar's eastern littoral forest have yielded a new species, *Ludia craggiana* Z. S. Rogers, Randrianasolo & J. S. Miller (Salicaceae), which is apparently endemic to two sandy forest fragments located near Vohémar in northeastern Madagascar. This species is most similar to *L. ludiifolia* (H. Perrier) Capuron & Sleumer, but can be distinguished by its more robust young stems and spines, glabrous or rarely puberulent twigs, petioles, midribs, and pedicels, coriaceous leaves with midveins and secondary venation of similar thickness, 50 to 60 stamens with emarginate anther connectives, and by the minutely granular-papillose fruit surface. *Ludia craggiana* is illustrated and assigned a provisional conservation status of endangered.

Résumé. Des inventaires botaniques récents effectués dans les forêts littorales de l'Est de Madagascar ont conduit à la découverte d'une nouvelle espèce *Ludia craggiana* Z. S. Rogers, Randrianasolo & J. S. Miller (Salicaceae), qui est apparemment endémique de deux fragments de forêt littorale sur sable aux environs de Vohémar au NE de Madagascar. Cette espèce ressemble beaucoup à *L. ludiifolia* (H. Perrier) Capuron & Sleumer mais se distingue de celle-ci par ses jeunes rameaux et ses épines plus robustes, ses ramilles et ses nervures médianes ainsi que ses pedicelles glabres ou rarement puberulents, ses feuilles coriaces à nervures primaires et secondaires d'épaisseur semblable, ses 50 à 60 étamines avec des anthères à connectifs emarginés, et par la surface du fruit finement granulaire-papillée. Une illustration ainsi qu'un statut de conservation provisoire rattaché à la catégorie "en danger" de cette espèce sont présentés.

Key words: IUCN Conservation Status, *Ludia*, Madagascar, Salicaceae.

Ludia Commerson ex Jussieu (Salicaceae) is composed of 23 species, 21 endemic to Madagascar, one endemic to the Comoros, and one widespread (*L. mauritiana* J. F. Gmelin) from eastern Africa to Madagascar, the Mascarenes, and the Seychelles (Sleumer, 1972a, b; Schatz, 2001). The genus has traditionally been considered a member of Flacourtiaceae (Perrier de la Bâthie, 1946; Sleumer, 1972a), but Chase et al. (2002) showed that the family was polyphyletic and provided molecular data supporting a more broadly defined Salicaceae, including many genera from the Flacourtiaceae, with the remainder assigned to the Achariaceae. In their classification, *Ludia* was placed in the tribe Flacourtieae in this redefined Salicaceae. Within Madagascar, *Ludia* may be distinguished from *Scolopia* Schreber by its apetalous (vs. petalous) flowers, an anther connective that does not extend beyond the apex of the thecae (vs. distinctly elongated), and leaves that are almost always penninerved (vs. 3- to 5-palmatinerved) (Perrier de la Bâthie, 1946; Sleumer, 1972a, b; Schatz, 2001).

Since November 2000, three collections that represent an undescribed species of *Ludia* have been discovered through the Missouri Botanical Garden's efforts to inventory the fragmented eastern littoral forests of Madagascar. The species, *L. craggiana* Z. S. Rogers, Randrianasolo & J. S. Miller, is formally described here and compared to *L. ludiifolia* (H. Perrier) Capuron & Sleumer, the closest putative relative.

Ludia craggiana Z. S. Rogers, Randrianasolo & J. S. Miller, sp. nov. TYPE: Madagascar. Antsiranana: "Fivondronona Vohémar, Firaisana Nosibe, Fokontany Anjiabe, forêt littorale sur sable d'Anaborano, près du Lac Sahaka," 25 m, 2 Nov. 2002, *J. Rabenantoandro, R. Rabevohitra, G. McPherson, H. Ranarivelo, Jean Claude & M. Sola 1085* (holotype, MO; isotypes, P, TEF). Figure 1.

Ludia craggiana; a *L. ludiifolia* caulibus juvenilibus et spinis robustioribus, ramunculis glabris vel raro puberulis (non dense pubescentibus), petiolis costis pedicellis trichomatibus rectis (non crispis) instructis, foliis coriaceis (non chartaceis) costis et nervis pariter prominentibus, staminibus 50 ad 60 (non 80 ad 90) antheris connectivo emarginato (non apiculato), fructibus minute granular-papillosis (non laevibus vel raro parum granular-papillosis) differt.

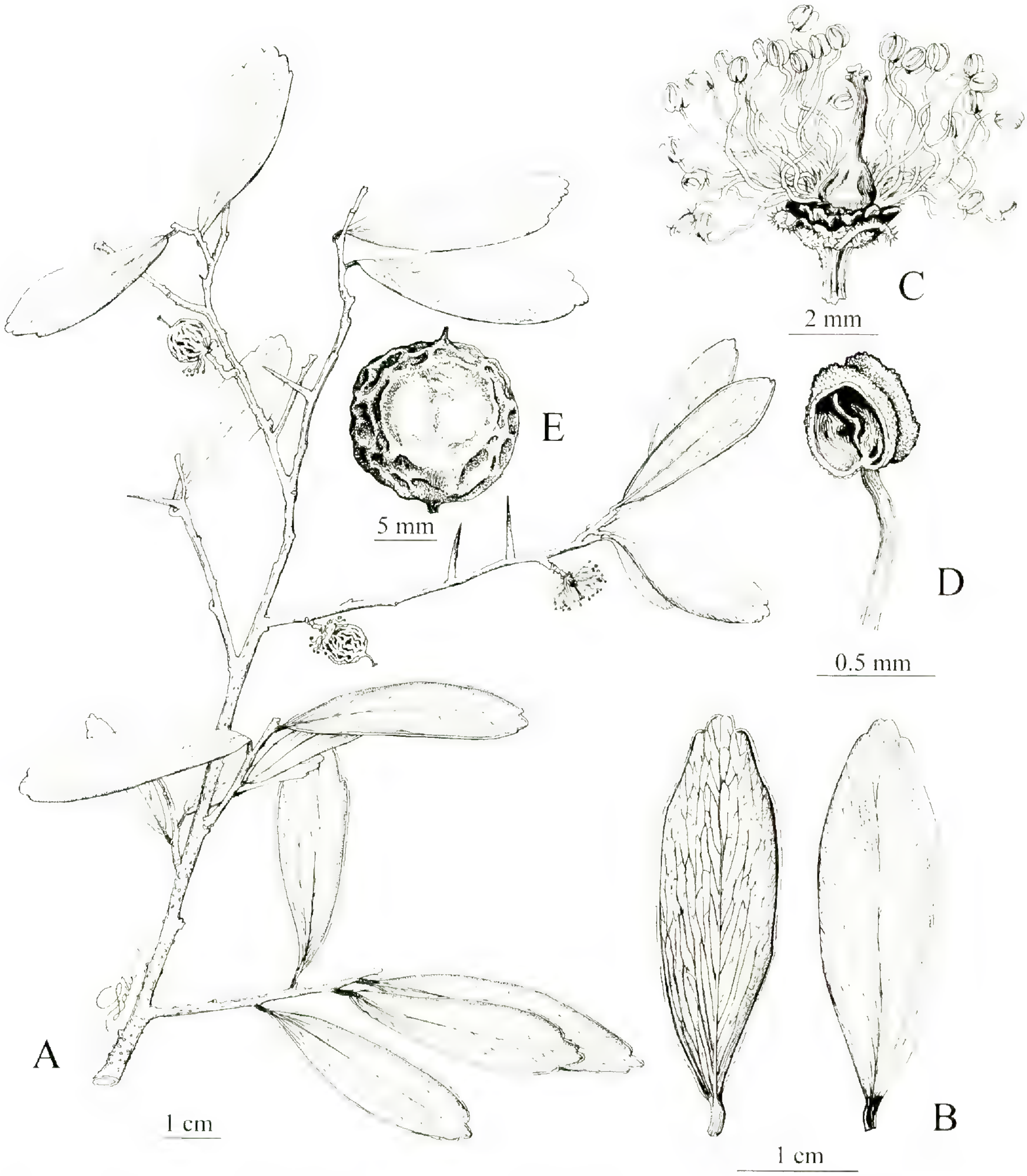

Figure 1. *Ludia craggiana* Z. S. Rogers, Randrianasolo & J. S. Miller. —A. Habit. —B. Leaf (left, abaxial surface; right, adaxial surface). —C. Flower (about half of the stamens removed to simplify the illustration). —D. Stamen. —E. Fruit. A, C–D drawn from TEF isotype (*J. Rabenantoandro et al. 1085*). B & E drawn from TEF paratype (*R. Rabevohitra et al. 4500*).

Trees to 10 m tall; young stems robust (ca. 1 mm diam.), glabrescent or rarely puberulent, densely lenticellate, spiny; spines axillary, lenticellate, (6–) 8–12 mm long, 1–1.5 mm wide (at base), rigid. *Leaves* alternate, stipulate; stipules small, caducous; petioles 1–2 mm long, glabrous or glabrescent; leaf blades obovate to oblanceolate, 2.1–5.1 × 0.6–1.8(–2.3) cm, (1.5)2.2–4.6:1 length/width ratio, the apex with 3 to 6 crenate or sinuate teeth, those forming usually irregular shallow to deep sinuses, the base cuneate, the margins slightly revolute, coriaceous and rigid, the midrib glabrous or glabrescent, not or only slightly distinguishable from secondary veins, venation penninerved, strongly ascending, composed of many fine subparallel, slightly raised striate veins on both surfaces, tertiary and higher order venation reticulate, nearly as prominent as secondaries. *Flowers* solitary in the leaf axils, hermaphroditic,

regular, pedicellate, subtended at base by 4 to 7 ovate bracts, these ca. 0.3 mm long, puberulous at apex; pedicels 1–1.5 mm long, puberulent to glabrescent; sepals 5 or 6, lobed, imbricate, coriaceous, ciliate; petals absent; nectary disk annular, glabrous, composed of many fleshy fused segments, those unequally lobed at the apex; stamens ca. 50 to 60, persistent, inserted on a flattened receptacle; filaments 3–4.5 mm long, unequal, glabrous; anthers longitudinally dehiscent, orbicular, 0.4–0.5 mm long, the connective not extended (i.e., not apiculate), many filamentous trichomes intermingled between nectary disk and stamens; gynoecium ca. 2.5 mm long, glabrous; ovary superior, 1-locular, ovoid, ca. 1 mm long; style ca. 1.5 mm long, flattened, occasionally shortly 3-branched near apex; stigma lobed. *Fruit* bacciform, indehiscent, 2-seeded, globose, 1.3–1.6 × ca. 1.4 cm, glabrous; dried fruit wall wrinkled, minutely granular-papillose, ca. 0.3 mm thick, crustaceous; style persistent; *seeds* 9–10 mm long, hemispheroidal (rounded on one side, flattened on the side adpressed to adjacent seed); seed coat very hard; endosperm present.

Distribution and phenology. *Ludia craggiana* grows in two littoral forest fragments on sand (25–65 m elevation recorded on specimen labels), which are adjacent to the coastal city of Vohémar (northeastern Madagascar, Antsiranana Province). The species flowers in October and November and fruits from November through February.

Vernacular name. Lamoty ala (*Rabenantoandro et al. 1085*).

Etymology. *Ludia craggiana* is named in honor of Gordon M. Cragg, former Chief of the Natural Products Branch of the Developmental Therapeutics Program of the National Cancer Institute (NCI). The natural products program of the NCI has supported significant collection of plant samples from tropical Africa and Madagascar, for discovery and development of new anticancer drugs through a series of collecting contracts with the Missouri Botanical Garden since 1986 (see Miller & Gereau, 2000; Miller et al., 2005). Dr. Cragg has been an enthusiastic supporter of botanical research and an outspoken advocate for conservation of tropical forests, recognizing them as a source of novel chemicals that provide a basis for drug development. Gordon Cragg's passion and enthusiastic support for botanical exploration is hereby acknowledged.

Conservation status (following IUCN, 2001, criteria). *Ludia craggiana* is known from two unprotected localities (ca. 30 km apart), which are part of the highly fragmented and severely threatened littoral forest vegetation remaining along the east coast of Madagascar. The estimated area of occupancy (AOO) for the species is 200 km^2 based on a 10 km^2 grid cell (size chosen based on the narrow distribution of the species and fragmented habitat of littoral vegetation in the region). An accurate extent of occurrence (EOO) is not calculable, given the lack of sufficient distribution points, but that figure is certainly much lower than the less than 5000 km^2 minimum threshold of the Endangered category (i.e., criterion B1). *Ludia craggiana* is assigned a provisional IUCN conservation status of Endangered (EN B1ab + B2ab).

Ludia craggiana differs from *L. ludiifolia* by the more robust young stems and spines, glabrous or rarely puberulent (vs. densely pubescent) twigs, petioles, midribs, and pedicels that, when pubescent, are covered by straight (vs. curled) trichomes, coriaceous (vs. chartaceous) leaves with equally prominent (vs. more obvious) midveins compared to the secondary venation, 50 to 60 (vs. 80 to 90) stamens with emarginate (vs. apiculate) anther connectives, and by the minutely granular-papillose (vs. smooth, or rarely slightly papillose) fruit surface. In addition to these substantial morphological differences, the two species are geographically and ecologically distinct; *L. craggiana* grows in eastern coastal forest on sand, whereas *L. ludiifolia* grows much farther inland in the northwest of the island on lateritic soils.

Paratypes. MADAGASCAR. **Antsiranana:** "Vohémar, commune rurale Nosy be, forêt sublittorale d'Analabe, sur sables blancs," *R. Rabevohitra, J. Rabenantoandro & R. Razakamalala 4500* (MO, P, TEF); "Fivondronona Vohémar, commune Vohémar, localité Ranotsara, fourré de dune sableux littorales, à 5 km Sud de Vohémar," *R. Randrianaivo, F. Rakotonasolo, H. Razafindraibe, A. Ratodimanana & E. Rakotobe 597* (MO, P, TEF).

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Literature Cited

Chase, M. W., S. Zmarzty, M. D. Lledo, K. J. Wurdack, S. M. Swensen & M. F. Fay. 2002. When in doubt, put it in Flacourtiaceae: A molecular phylogenetic analysis based on plastid *rbc*L DNA sequences. Kew Bull. 57: 141–181.

IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN, Gland, Switzerland, and Cambridge, United Kingdom. IUCN Species Survival Commission.

Miller, J. S. & R. E. Gereau. 2000. Therapeutic potential of plant-derived compounds: Realizing the potential. Pp. 25–37 *in* S. J. Cutler & H. G. Cutler (editors), Biologically Active Natural Products: Pharmaceuticals. CRC Press, Boca Raton.

———, A. Bradley, A. Randrianasolo, R. Randrianaivo & S. Rakotonandrasana. 2005. Sampling a diverse flora for novel biochemicals: An analysis of NCI collections from Madagascar. Econ. Bot. 59: 221–230.

Perrier de la Bâthie, H. 1946. Flacourtiacées. *In* H. Humbert (editor), Flore de Madagascar et des Comores 140: 1–131.

Schatz, G. E. 2001. Generic Tree Flora of Madagascar. Cromwell Press, Royal Botanic Gardens, Kew, and Missouri Botanical Garden.

Sleumer, H. 1972a. Révision du genre *Ludia* Comm. ex Juss. (Flacourtiacées). Adansonia, sér. 2, 12: 79–102.

———. 1972b. A taxonomic revision of the genus *Scolopia* Schreb. (Flacourtiaceae). Blumea 20: 25–61.

Mariosousa, a New Segregate Genus from *Acacia* s.l. (Fabaceae, Mimosoideae) from Central and North America

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Abstract. Recent studies have shown that the genus *Acacia* Miller s.l. is polyphyletic, consisting of at least five distinct groups of species. One of these groups, the proposed genus *Mariosousa* Seigler & Ebinger, consists of 13 species. We have made the following new combinations: *Mariosousa acatlensis* (Bentham) Seigler & Ebinger, *M. centralis* (Britton & Rose) Seigler & Ebinger, *M. compacta* (Rose) Seigler & Ebinger, *M. coulteri* (Bentham in A. Gray) Seigler & Ebinger, *M. dolichostachya* (S. F. Blake) Seigler & Ebinger, *M. durangensis* (Britton & Rose) Seigler & Ebinger, *M. mammifera* (Schlechtendal) Seigler & Ebinger, *M. millefolia* (S. Watson) Seigler & Ebinger, *M. russelliana* (Britton & Rose) Seigler & Ebinger, *M. salazarii* (Britton & Rose) Seigler & Ebinger, *M. sericea* (Martens & Galeotii) Seigler & Ebinger, *M. usumacintensis* (Lundell) Seigler & Ebinger, and *M. willardiana* (Rose in Vasey & Rose) Seigler & Ebinger. These species are restricted to tropical and subtropical regions of the southwestern United States, Mexico, and Central America. In addition to their close geographic affinities, a series of morphological characteristics, as well as recent molecular data, separate this new genus, which has been commonly referred to as the *Acacia coulteri* group. They are morphologically distinct from other species of *Acacia* subg. *Aculeiferum* Vassal in that they always lack prickles and are never lianas. Although this group of species is monophyletic, previous taxonomic treatments have not dealt with them as a separate unit within *Acacia* subg. *Aculeiferum*.

Key words: *Acacia coulteri* group, *Acacia* subg. *Aculeiferum*, *Acacia* sensu lato, Fabaceae, *Mariosousa*.

As presently defined, *Acacia* Miller is a cosmopolitan genus of more than 1350 species found throughout the tropical and subtropical regions of both the Old and New Worlds (Maslin et al., 2003). Placed in the tribe *Acacieae* within the subfamily Mimosoideae (Fabaceae), the genus has traditionally comprised three large subgenera: *Acacia* subg. *Acacia* (ca. 161 species), subgenus *Aculeiferum* Vassal (ca. 235 species), and subgenus *Phyllodineae* (DC.) Seringe (ca. 960 species). It has been suggested that the genus is polyphyletic, and within the past 35 years various classifications have been proposed that divided the genus into three genera, mostly corresponding to the three traditional subgenera (Vassal, 1972; Pedley, 1978, 1986). These proposals have not been widely accepted until recently. Most students of this genus have thought that more data were needed to make informed decisions concerning the generic status of *Acacia* (Maslin, 1988).

It is now generally agreed that the genus *Acacia* s.l. is polyphyletic. Also, there has been recent accumulation of data derived from morphological and molecular studies that has led to a better understanding of the probable relationships within the genus, as well as the position of the genus within the Mimosoideae (Maslin, 1988; Chappill & Maslin, 1995; Clarke, 1995; Clarke et al., 2000; Maslin et al., 2000, 2003; Miller & Bayer, 2001, 2003; Luckow et al., 2003). One result of these studies is that a small group of 13 species, commonly referred to as the *Acacia coulteri* group, should be placed in a separate genus.

Results and Discussion

The complex of about 235 species worldwide that are presently placed in *Acacia* subg. *Aculeiferum* Vassal (1972) (approximately the same as series

Vulgares Bentham (1875)) can be divided into several informal species groups based on overall similarities of habit, stipule structure and persistence, presence or absence of prickles, presence or absence of short shoots, petiolar gland shape and structure, shape and venation of leaflets, and inflorescence structure (Jawad et al., 2000). At the present time, however, many of these informal groups within subgenus *Aculeiferum* have not been established to be monophyletic units, and have not been formally described. Most American species of this subgenus should be transferred to *Senegalia* Rafinesque (Pedley, 1978, 1986) or to *Acaciella* Britton & Rose (*Acacia* subg. *Aculeiferum* sect. *Filicinae* Pedley). We have recently reviewed the status of American species of *Senegalia* (Seigler et al., 2006).

The taxa of another of the groups of phenetically similar species, the *Acacia coulteri* species group (Maslin & Stirton, 1997), herein described as a new genus *Mariosousa* Seigler & Ebinger, were recently revised using morphometric studies involving principal components analysis (Jawad et al., 2000). Taxa of this species group are unarmed, erect shrubs and small trees with persistent, herbaceous stipules, relatively unspecialized petiolar glands, and flowers in cylindrical spikes. Except for minor differences in flower size and pubescence, the flowers of these taxa are very similar. The 13 taxa of the *A. coulteri* group range from Arizona, south through Mexico into Costa Rica. They are morphologically distinct from other species of *Acacia* subg. *Aculeiferum* in that they always lack prickles and are never lianas. Although this species group appears to be monophyletic, previous taxonomic treatments have not dealt with these species as a separate unit within *Acacia* subg. *Aculeiferum* (Bentham, 1875; Standley, 1922; Britton & Rose, 1928).

Members of the *Acacia coulteri* group can be distinguished from those of *Senegalia* by the absence of prickles and the order of development of the earliest leaves (Vassal, 1972). Those of the *A. coulteri* group are pinnate, pinnate, and then bipinnate, whereas the first three leaves of *Senegalia* species are bipinnate or a single pinnate leaf followed by two bipinnate leaves (Vassal, 1972). *Vachellia* Wight & Arnott species produce two pinnate leaves followed by a bipinnate leaf (Vassal, 1972). *Acacia coulteri* group species can usually be distinguished from members of the genus *Acaciella* (formerly subg. *Aculeiferum* sect. *Filicinae*) by the presence of petiolar nectaries, although they are sometimes missing in *Mariosousa salazarii* (Britton & Rose) Seigler & Ebinger and usually missing in *M. millefolia* (S. Watson) Seigler & Ebinger. The subtending floral bracts of the *A. coulteri* group species are usually caducous, whereas those of genus *Acaciella* are usually persistent, even into fruiting condition in many species. The stamens of dried *A. coulteri* group specimens are tan, brown, or occasionally red-brown in color, whereas those of *Acaciella* species possess a characteristic brown-orange color. The funiculus of many members of genus *Acacia* (former *Acacia* subg. *Phyllodineae*) is arillate (Vassal, 1972), but not so in species of the *A. coulteri* group. Furthermore, many species of *Acacia* possess phyllodes (Maslin et al., 2003), whereas the leaves of all members of *A. coulteri* group are bipinnate, although the pinnae of *M. willardiana* (Rose in Vasey & Rose) Seigler & Ebinger leaves are dropped under dry conditions. The points of detachment can still be seen, however. Species of the *A. coulteri* group can be distinguished from *Vachellia* species by the absence of stipular spines and the presence of vegetative, although sometimes weakly scarious, stipules. The ovaries of *A. coulteri* group species are often stipitate, whereas those of genus *Vachellia* are usually subsessile or sessile. Members of the genus *Vachellia* have a true involucre on the peduncle; this feature is lacking in species of the *A. coulteri* group. Members of the *A. coulteri* group can usually be distinguished readily from members of the tribe Ingeae because the stamen filaments of the former are free to the base, whereas those of Ingeae species are characteristically fused into a tube for a significant portion of the length of the filaments. The leaves of many members of the genus *Inga* Miller and one *Cojoba* Britton & Rose species are pinnately compound, whereas mature leaves of the *A. coulteri* group are uniformly bipinnate.

Previous DNA studies have shown that both the genus *Acacia* s.l. and *Acacia* subg. *Aculeiferum* s.l. are polyphyletic (Robinson & Harris, 2000; Clarke, 1995; Clarke et al., 2000; Miller & Bayer, 2000; Luckow et al., 2003; Miller et al., 2003; Seigler et al., 2006). Furthermore, although they were inadequately sampled in most of these studies, two groups of species within *Acacia* subg. *Aculeiferum* s.l., *Acaciella* (subg. *Aculeiferum* sect. *Filicinae*) and species belonging to the *Acacia coulteri* group (*Mariosousa*), are distinct from a major part of the subgenus, which is now considered to comprise the genus *Senegalia* (Seigler et al., 2006).

In the present study, DNA from 34 vouchers representing 30 species of mimosoid legumes was sequenced for the chloroplast loci: *mat*K, *trn*L intron, *trn*L-*trn*F intergenic spacer region. Sampling included representatives of the major lineages of *Acacia* s.l., including the genera *Senegalia* (*Acacia* subg. *Aculeiferum*, in part) (Seigler et al., 2006), *Vachellia* (formerly *Acacia* subg. *Acacia*) (Seigler & Ebinger, 2005), *Acacia* (formerly *Acacia* subg. *Phyllodineae*),

Mariosousa (*Acacia* subg. *Aculeiferum* species related to the *Acacia coulteri* group), and *Acaciella* (subg. *Aculeiferum* sect. *Filicinae*) (Britton & Rose, 1928), as well as *A. visco* Lorenz ex Grisebach, *A. galpinii* Burtt Davy, and several species of the tribe Ingeae. *Mimosa tenuiflora* (Willdenow) Poiret was used as the outgroup. African and Asian representatives that may be transferred to *Vachellia* and *Senegalia* in the future also are included (Table 1).

Maximum parsimony analyses were performed on the aligned sequences using the heuristic search option (excluding uninformative characters) in PAUP* 4.0 (Swofford, 1999). A four-step search method for multiple islands was performed using 10,000 random replicates (Olmstead & Palmer, 1994). Support for internal branches was evaluated by using the fast bootstrap method with 1000 replicates (Felsenstein, 1985).

The heuristic analysis found 220 trees of 892 steps with a consistency index (CI) of 0.85 and a retention index (RI) of 0.80. A strict consensus tree with bootstrap support values is shown in Figure 1. The basal clade (Clade A) is *Vachellia*, which is supported by a bootstrap value of 100% and contains both American and African species. All species other than *Vachellia* plus *Acacia tortilis* (which we consider within *Vachellia*) are placed in a separate clade (Clade B, 67% bootstrap value). This confirms previous results that show *Vachellia* to be relatively distantly related to other *Acacia* s.l. taxa (Luckow et al., 2003; Miller et al., 2003).

The genus *Senegalia* (Clade C) is supported by a bootstrap value of 89% and is sister to the rest of the species examined. The remaining species are divided into two clades (Clades D and H).

Clade D is a monophyletic entity comprised of 10 samples of six species related to the *Acacia coulteri* group (*Mariosousa*) (68% bootstrap value). This clade can be subdivided into two subclades E and F. Clade E (60% bootstrap value) is comprised of *M. willardiana* (S. F. Blake) Seigler & Ebinger and *M. salazarii* (Lundell) Seigler & Ebinger, whereas Clade F (91% bootstrap value) contains the remaining species. Multiple samples of *M. dolichostachya* and *M. usumacintensis* are placed in an unresolved polytomy (Clade G, 68% bootstrap value). The final major clade (Clade H) contains species of tribe Ingeae, *Acacia* (formerly subg. *Phyllodineae*), *Acaciella*, and two taxa of *Acacia* subg. *Aculeiferum*, *A. visco* and *A. galpinii*, that as of the present have unclear relationships. Of these, *Acaciella* plus *Acacia boliviana* (which we consider within *Acaciella*) is monophyletic (Clade I, 100% bootstrap value). The combined Ingeae/*Acacia* clade (Clade J) is poorly supported (51% bootstrap value). However, the two species of *Acacia* (formerly subg. *Phyllodineae*) form a strongly supported clade (93% bootstrap value) within Clade J and are monophyletic.

In summary, increased sampling confirms previous results that suggested monophyly of the group of species related to the *Acacia coulteri* group (*Mariosousa*) and, furthermore, suggests two lineages within this genus.

Description of the Genus

Mariosousa Seigler & Ebinger, gen. nov. TYPE: *Mariosousa coulteri* (Bentham) Seigler & Ebinger [= *Acacia coulteri* Bentham in A. Gray, Pl. Wright. 1: 66. 1852].

Frutices et arbores parvae, inermes, ramulis non flexuosis; stipulae persistentes, herbaceae; rhachis saepe supra canaliculata; glandula prope basim petiolorum, etiam interjuga aliquapinnarum; foliola parva, 1 ad 44-juga, linearia vel oblonga, obliqua; flores pentameri, albo-lutei, sessiles, in spicis cylindricis; stamina distincta, interdum ultra 50; legumina sine cremore, dehiscentia, oblongo-linearia, compressa; acini complanati, glabri.

Unarmed shrubs and trees; twigs usually not flexuous; short shoots usually absent. Leaves alternate, bipinnately compound; stipules herbaceous, narrowly triangular to linear, persistent; petioles mostly adaxially grooved; petiolar glands small, mostly solitary (rarely absent); rachis usually adaxially grooved with a small gland between the upper 1 or 2 pinna pairs; pinnae 1 to 44 pairs per leaf, mostly with numerous leaflets (4 to 65 pairs); leaflets small (mostly less than 10 mm long), opposite, linear to oblong, the base oblique. Inflorescence a cylindrical spike; involucre absent; floral bracts linear, early deciduous. Flowers sessile, creamy white; the tubular calyx and corolla each 5-lobed; stamens numerous (50+), separate; the stipitate ovary usually glabrous. Legumes straight, flattened, oblong, lacking pulp, dehiscent, transversely to irregularly striate, with a distinct stipe. Seeds uniseriate, strongly flattened, smooth, usually with a large U-shaped pleurogram covering 50%–70% of the seed.

Etymology. *Mariosousa* honors Mario Sousa, former Director of the Herbarium of the Instituto de Biología (MEXU), Universidad Autónoma de México, who has done extensive work in *Acacia* systematics, directed the research of a number of students in this area, and collected many specimens of this genus.

Detailed descriptions, geographic distribution, and representative specimens of all species can be found in Jawad et al. (2000).

Table 1. Species used in this study. Genbank numbers are for the *Mat*K and *trn*L chloroplast DNA regions. The species *Acacia boliviana*, *A. galpinii*, *A. schweinfurthii*, *A. tortilis*, and *A. risco* should be considered as members of *Acacia* s.l.

Taxonomic grouping	Species	Voucher/collector	GenBank accessions
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa acatlensis*	DS16002	DQ371890, DQ371874
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa coulteri*	DS15953	DQ371893, DQ371868
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa dolichostachya*	DS16035	DQ371892, DQ371866
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa dolichostachya*	DS16044	DQ371896, DQ371867
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa dolichostachya*	DS16040	DQ371894, DQ371873
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa salazarii*	DS15978	DQ371888, DQ371865
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa salazarii*	DS15984	DQ371897, DQ398003
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa usumacintensis*	DS15950	DQ371891, DQ371864
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa usumacintensis*	DS16025	DQ371889, DQ371863
Acacia subg. *Aculeiferum* *Acacia coulteri* group	*Mariosousa willardiana*	DLEG 89-0143	AY386898, DQ371862
former subg. *Acacia*	*Acacia tortilis* (Forsskal) Hayne	CANB 615593	AF274140, AF522974
former subg. *Acacia*	*Vachellia campechiana* (Miller) Seigler & Ebinger	CANB 615587	AF274133, AY574113
former subg. *Acacia*	*Vachellia collinsii* (Safford) Seigler & Ebinger	DS16038	DQ371877, DQ371869
former subg. *Acacia*	*Vachellia cornigera* (L.) Seigler & Ebinger	DS16019	DQ371886, DQ398004
former subg. *Acacia*	*Vachellia schottii* (Torrey) Seigler & Ebinger	CANB 615589	AF274136, AF522971
former subg. *Acacia*	*Vachellia vernicosa* (Britton & Rose) Seigler & Ebinger	CANB 615605	AF523113, AF522970
former subg. *Phyllodineae*	*Acacia lycopodiifolia* A. Cunningham ex Hooker	CANB 615616	DQ371879, AF195705, AF195686
former subg. *Phyllodineae*	*Acacia melanoxylon* R. Brown	CANB 615580	AF274166, AF195699, AF195680
subg. *Aculeiferum*	*Acacia galpinii*	CANB 615736	AF523098, AF522988
subg. *Aculeiferum*	*Acacia risco*	CANB 615607	AF523116, AF522982
subg. *Aculeiferum*	*Acacia schweinfurthii* Brenan & Exell	CANB 615609	AF523101, AF522979
subg. *Aculeiferum*	*Senegalia senegal* (L.) Britton & P. Wilson	CANB 615554	AF274143, AF195700, AF195681
subg. *Aculeiferum*	*Senegalia gaumeri* (Blake) Britton & Rose	DS16042	DQ371895, DQ371858
subg. *Aculeiferum*	*Senegalia roemeriana* (Scheele) Britton & Rose	CANB 615608	AF523099, AF522977
subg. *Aculeiferum*	*Senegalia wrightii* (Bentham) Britton & Rose	DLEG 900444	AF274148, DQ371854
subg. *Aculeiferum* sect. *Filicinae*	*Acaciella angustissima* (Miller) Britton & Rose	DS15993	DQ371887, DQ371872
subg. *Aculeiferum* sect. *Filicinae*	*Acacia boliviana* Rusby	CANB 615555	AF274144, AF522981
Ingeae	*Albizia lebbeck* (L.) Bentham	DLEG 99-0005	DQ398005, DQ371875
Ingeae	*Havardia pallens* (Bentham) Britton & Rose	CANB 615547	AF274125, AF522955
Ingeae	*Inga edulis* Martius	MEL 2066677	AF523078, AF522957
Ingeae	*Parachidendron pruinosum* Koorders	CANB 615549	AF274127, AF522961
Ingeae	*Paraserianthes lophantha* (Willdenow) I. C. Nielsen	CANB 615550	AF274128, AF522962
Ingeae	*Zapoteca tetragona* (Willdenow) H. M. Hernandez	CANB 615626	AF523097, AF522966
Mimoseae	*Mimosa tenuiflora*	CANB 615541	AF274120, AF522943

KEY TO THE SPECIES OF *MARIOSOUSA* IN CENTRAL AND NORTH AMERICA

1a. Pinnae mostly with more than 36 pairs of leaflets, especially those near the middle of the rachis.
  2a. Petiolar gland(s) flattened, usually located on the lower third of the petiole; leaflet apex obtuse to broadly acute.
    3a. Leaflets 1.2–1.9 mm wide; leaves with more than 6 pairs of pinnae. . . . . 12. *M. usumacintensis*
    3b. Leaflet mostly less than 1.2 mm wide; most leaves with 6 or fewer pairs of pinnae . . . . 5. *M. dolichostachya*
  2b. Petiolar gland(s) saucer-shaped to cup-shaped, usually located on the upper half of the petiole, rarely absent; leaflet apex narrowly acute to acuminate.
    4a. Minute purple glands common at the base of the leaflet and usually along the rachis; leaflets lacking long hairs on the lower side at the base . . . . . 1. *M. acatlensis*
    4b. Minute purple glands absent; leaflets usually with long hairs on the lower side at the base . . 2. *M. centralis*
1b. Pinnae mostly with fewer than 36 pairs of leaflets, or pinnae absent.
  5a. Leaves less than 30 mm long, some clustered on short shoots. . . . . 3. *M. compacta*
  5b. Leaves more than 30 mm long; short shoots absent; pinnae sometimes absent in *Acacia willardiana*.
    6a. Leaflets appressed to erect-pubescent on both surfaces, usually densely so; minute purple glands common on the rachis and pinna rachises.
      7a. Petiole and rachis densely pubescent with erect hairs about 0.3 mm long; petiolules less than 2.1 mm long; fruit pubescent . . . . . 11. *M. sericea*
      7b. Petiole and rachis glabrous or with short, appressed hairs; petiolules more than 2.1 mm long; fruit glabrous.
        8a. Petiolar glands raised, the apex bulbous; most leaves with fewer than 7 pairs of pinnae . . . . . 7. *M. mammifera*
        8b. Petiolar glands sessile and with an irregularly raised apex; most leaves with more than 10 pairs of pinnae . . . . . 6. *M. durangensis*
    6b. Leaflets glabrous or lightly appressed-pubescent beneath; minute purple gland absent.
      9a. Leaves mostly with a single pair of pinnae (rarely 2 or 3); many petioles more than 100 mm long . . . . . 13. *M. willardiana*
      9b. Leaves mostly with 4 or more pairs of pinnae; petioles less than 70 mm long.
        10a. Rachis gland between the upper pinna pair stalked, with a globose apex; shrub or small tree less than 4 m tall . . . . . 8. *M. millefolia*
        10b. Rachis gland between the upper pinna pair sessile, usually saucer-shaped, cup-shaped, or absent; large shrub or tree, more than 4 m tall.
          11a. Bark of trunk and larger branches exfoliating and papery; petiolar glands absent on many petioles; leaflet apex acuminate. . . . . 10. *M. salazarii*
          11b. Bark of trunk and larger branches smooth to furrowed, not exfoliating; petiolar glands present; leaflet apex broadly acute to obtuse.
            12a. Leaflets appressed pubescent beneath; rachis and pinna rachises puberulent above; perianth pubescent . . . . . 4. *M. coulteri*
            12b. Leaflets glabrous beneath; rachis, pinna rachises, and perianth glabrous or nearly so. . . . . 9. *M. russelliana*

1. Mariosousa acatlensis (Bentham) Seigler & Ebinger, comb. nov. Basionym: *Acacia acatlensis* Bentham, London J. Bot. 1: 513. 1842. *Senegalia acatlensis* (Bentham) Britton & Rose, N. Amer. Fl. 23: 112. 1928. TYPE: Mexico. Puebla: Acatlán, May 1830, *G. Andrieux 396* (holotype, K; isotypes, G, US, K photos F, MEXU, MICH, NY, TEX).

Senegalia submontana Britton & Rose, N. Amer. Fl. 23: 113. 1928. TYPE: Mexico. Oaxaca: cerro San Antonio, 1800 m, 12 Oct. 1907, *C. Conzatti 2046* (holotype, US; isotypes, F, MEXU, NY).

Britton and Rose (1928) listed the type as *Conzatti 25,346*. On the NY isotype, Britton wrote "the number of this specimen was erroneously printed 25,346."

2. Mariosousa centralis (Britton & Rose) Seigler & Ebinger, comb. nov. Basionym: *Senegalia centralis* Britton & Rose, N. Amer. Fl. 23: 113. 1928. *Acacia centralis* (Britton & Rose) Lundell, Contr. Univ. Michigan Herb. 4: 7. 1940. TYPE: El Salvador, near San Salvador, 1923, *S. Calderón 1774* (holotype, NY; isotypes, BM, F).

3. Mariosousa compacta (Rose) Seigler & Ebinger, comb. nov. Basionym: *Acacia compacta* Rose, Contr. U.S. Natl. Herb. 8: 31. 1903. *Senegalia compacta* (Rose) Britton & Rose, N. Amer. Fl. 23: 111. 1928. TYPE: Mexico. Oaxaca: Tomellin Canyon, 24 June 1899, *J. N. Rose & W. Hough 4680* (holotype, US; isotypes, GH, K, NY).

Lysiloma standleyana Britton & Rose, N. Amer. Fl. 23: 81. 1928. TYPE: Mexico. Oaxaca: Tomellin, Sep. 1905, *J. N. Rose 10082* (holotype, NY; isotypes, NY photos F, MO).

4. Mariosousa coulteri (Bentham in A. Gray) Seigler & Ebinger, comb. nov. Basionym: *Acacia coulteri* Bentham in A. Gray, Pl. Wright. 1: 66. 1852. *Senegalia coulteri* (Bentham) Britton & Rose, N. Amer. Fl. 23: 112. 1928. TYPE: Mexico. Hidalgo: Zimapán, *T. Coulter s.n.* (holotype, K; isotypes, US fragment, K photos F, GH, MEXU, MICH, MO, NY, US).

Not *Acacia coulteri* Bentham in A. Gray sensu Rico-Arce and Rodríguez (1998) and Rico-Arce (2001).

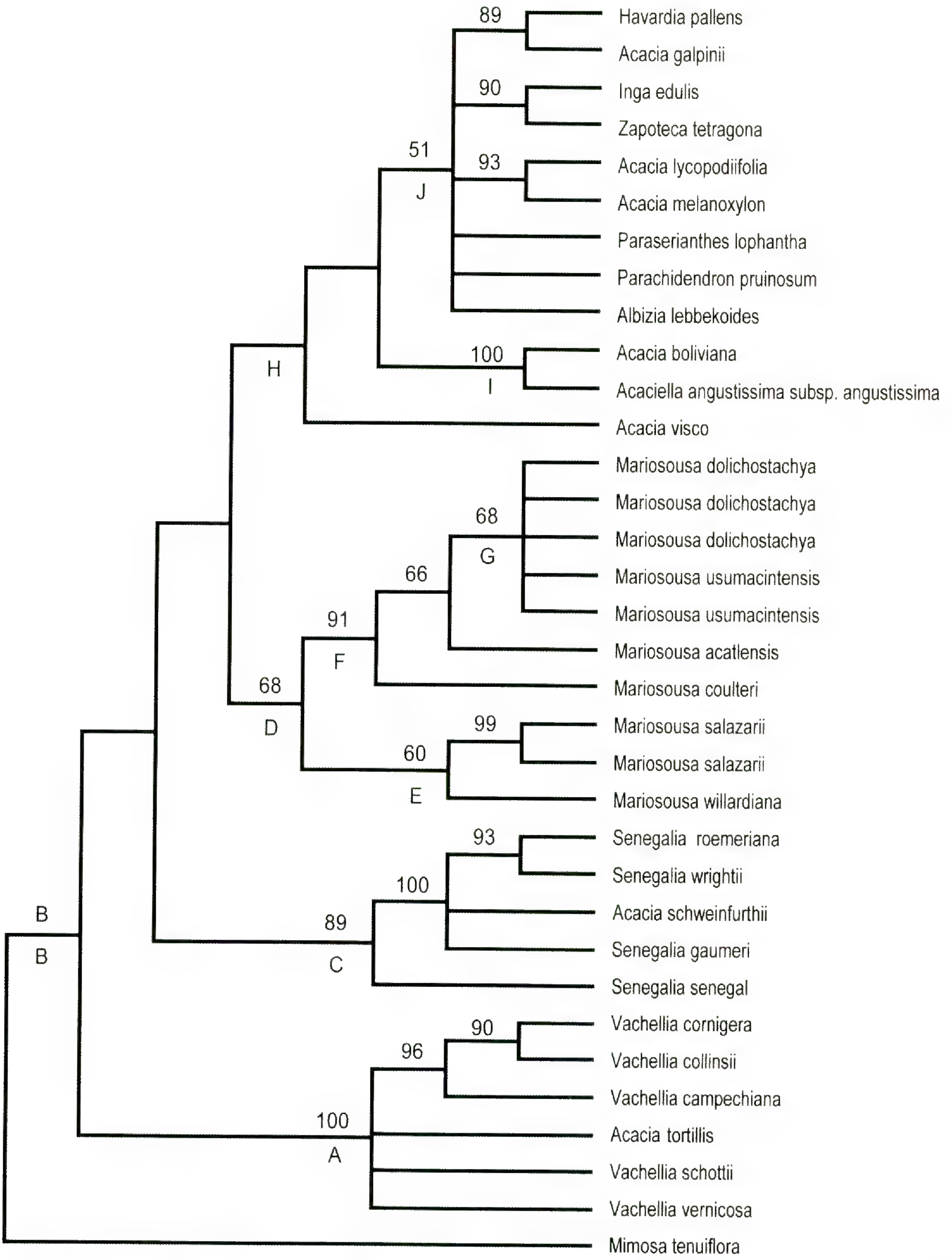

Figure 1. Strict consensus tree of 220 most parsimonious trees from the *mat*K and *trn*L combined datasets. Bootstrap values are above branches. Refer to text for discussion of the clades labeled (A–J). The names *Acacia boliviana*, *A. galpinii*, *A. schweinfurthii*, *A. tortilis*, and *A. visco* should be considered as members of *Acacia* s.l.

5. **Mariosousa dolichostachya** (S. F. Blake) Seigler & Ebinger, comb. nov. Basionym: *Acacia dolichostachya* S. F. Blake, Proc. Biol. Soc. Washington 34: 43. 1921. *Senegalia dolichostachya* (S. F. Blake) Britton & Rose, N. Amer. Fl. 23: 112. 1928. TYPE: Mexico. Yucatán: Las Bocas de Silam, May 1916, *G. F. Gaumer & Sons 23329* (holotype, F; isotypes, F, G, F photo NY).

6. **Mariosousa durangensis** (Britton & Rose) Seigler & Ebinger, comb. nov. Basionym: *Senegalia durangensis* Britton & Rose, N. Amer. Fl. 23: 112. 1928. *Acacia durangensis* (Britton & Rose) Jawad, Seigler & Ebinger, Ann. Missouri Bot. Gard. 87: 541. 2000. TYPE: Mexico. Durango: San Ramón, 21 Apr.–18 May 1906, *E. J. Palmer 107* (holotype, NY; isotypes, F, MO, UC, US, NY photo MEXU).

7. **Mariosousa mammifera** (Schlechtendal) Seigler & Ebinger, comb. nov. Basionym: *Acacia mammifera* Schlechtendal, Linnaea 12: 563. 1838. *Senegalia mammifera* (Schlechtendal) Britton & Rose, N. Amer. Fl. 23: 112. 1928. TYPE: Mexico. Hidalgo: Barranca de Acholoya, s.d., *C. A. Ehrenberg s.n.* (holotype, HAL; isotype, UC).

8. **Mariosousa millefolia** (S. Watson) Seigler & Ebinger, comb. nov. Basionym: *Acacia millefolia* S. Watson, Proc. Amer. Acad. Arts 21: 427. 1886. *Senegalia millefolia* (S. Watson) Britton & Rose, N. Amer. Fl. 23: 111. 1928. TYPE: Mexico. Chihuahua: Hacienda San José, near Batopilas, Aug. 1885, *E. J. Palmer 45* (lectotype, designated by Isely (1969: 379), GH; isotypes, MEXU, NY).

9. **Mariosousa russelliana** (Britton & Rose) Seigler & Ebinger, comb. nov. Basionym: *Senegalia russelliana* Britton & Rose, N. Amer. Fl. 23: 112. 1928. *Acacia russelliana* (Britton & Rose) Lundell, Contr. Univ. Michigan Herb. 4: 7. 1940. TYPE: Mexico. Sinaloa: vicinity of San Blas, 22 Mar. 1910, *J. N. Rose, P. C. Standley & P. G. Russell 13204* (holotype, US; isotypes, GH, NY).

10. **Mariosousa salazarii** (Britton & Rose) Seigler & Ebinger, comb. nov. Basionym: *Senegalia salazarii* Britton & Rose, N. Amer. Fl. 23: 113. 1928. *Acacia salazarii* (Britton & Rose) Lundell, Contr. Univ. Michigan Herb. 4: 8. 1940. TYPE: Mexico. Michoacán: Xochiapa, 13 Apr. 1912, *F. Salazar s.n.* (holotype, US; isotypes, MEXU, NY).

The description of *Acacia coulteri* in Rico-Arce and Rodríguez (1998) and Rico-Arce (2001) clearly corresponds to *A. salazarii* (now *Mariosousa salazarii*) in Jawad et al. (2000) and the present work. *Mariosousa coulteii* (*A. coulteri*) does not fall within the geographic or morphological range of *M. salazarii*.

11. **Mariosousa sericea** (Martens & Galeotii) Seigler & Ebinger, comb. nov. Basionym: *Acacia sericea* Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 10(2): 311. 1843. *Senegalia sericea* (Martens & Galeotti) Britton & Rose, N. Amer. Fl. 23: 111. 1928. TYPE: Mexico. Puebla: Tehuacán, 6000 ft., May 1840, *H. Galeotti 3345* (holotype, BM; isotypes, K, P, BM photos MEXU, MICH, NY).

Acacia pueblensis Brandegee, Univ. California Publ. Bot. 4: 85. 1910. TYPE: Mexico. Puebla: Cerro de Solunte, 7000–8000 ft., June 1909, *C. A. Purpus 3863* (holotype, UC; isotypes, BM, MO, NY, US, UC photo MEXU).

12. **Mariosousa usumacintensis** (Lundell) Seigler & Ebinger, comb. nov. Basionym: *Acacia usumacintensis* Lundell, Contr. Univ. Michigan Herb. 4: 8. 1940. TYPE: Mexico. Tabasco: Boca Cerro on the Río Usumacinta above Tenosique, 1–5 July 1939, *E. Matuda 3550* (holotype, MICH; isotypes, K, LL, MEXU, MICH, NY).

13. **Mariosousa willardiana** (Rose in Vasey & Rose) Seigler & Ebinger, comb. nov. Basionym: *Acacia willardiana* Rose in Vasey & Rose, Contr. U.S. Natl. Herb. 1: 88. 1890. TYPE: Mexico. Sonora: rocky islands and ledges on the coast of Guaymas, 1–2 Apr. 1890, *E. J. Palmer 164* (holotype, US).

Because of the recent conservation of the type for *Acacia* with an Australian species, the desirability and timeliness of transferring species of the former subgenus *Aculeiferum* to a new genus *Mariosousa*, the fact that the name *Acacia willardiana* Rose has been used for this species by most workers and that name is widely employed in floras of Mexico, and in order to contribute to nomenclatural stability, we have made a proposal to conserve the name *A. willardiana* Rose in Vasey and Rose (1890). If accepted, the name for this taxon must become *Mariosousa willardiana* (Rose) Seigler & Ebinger.

Prosopis heterophylla Bentham, London J. Bot. 5: 82. 1846. *Senegalia heterophylla* (Bentham) Britton & Rose, N. Amer. Fl. 23: 114. 1928. TYPE: Mexico. Sonora: Alta, 1830, *T. Coulter s.n.* (holotype, TCD).

Not *Acacia heterophylla* Willdenow (1806: 1049–1093), a widespread extra-Australian phyllodinous species of Madagascar and the Indian and Pacific oceans.

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Literature Cited

Bentham, G. 1875. Revision of the order Mimoseae. Trans. Linn. Soc. London 30: 335–664.

Britton, N. L. & J. N. Rose. 1928. Mimosaceae. North American Flora 23: 1–194.

Chappill, J. A. & B. R. Maslin. 1995. A phylogenetic assessment of tribe Acacieae. Pp. 77–99 *in* M. D. Crisp & J. J. Doyle (editors), Advances in Legume Systematics, 7: Phylogeny. Royal Botanic Gardens, Kew.

Clarke, H. D. 1995. Systematic and evolutionary studies of *Acacia* series *Gummiferae* (Fabaceae: Mimosoideae). Ph.D. Thesis, University of Illinois, Urbana-Champaign.

———, S. R. Downie & D. S. Seigler. 2000. Implications of chloroplast DNA restriction site variation for systematics of *Acacia* (Fabaceae: Mimosoideae). Syst. Bot. 25: 618–632.

Felsenstein, J. 1985. Confidence limits on phylogenies: An approach using the bootstrap. Evolution 39: 783–791.

Isely, D. 1969. Legumes of the United States: I. Native *Acacia*. Sida 3: 365–386.

Jawad, J. T., D. S. Seigler & J. E. Ebinger. 2000. A systematic treatment of *Acacia coulteri* (Fabaceae, Mimosoideae) and similar species in the New World. Ann. Missouri Bot. Gard. 87: 528–548.

Luckow, M., J. T. Miller, D. J. Murphy & T. Livshultz. 2003. A phylogenetic analysis of the Mimosoideae (Leguminosae) based on chloroplast DNA sequence data. Pp. 1–24 *in* B. Klitgaard & A. Bruneau (editors), Advances in Legume Systematics, 10. Royal Botanic Gardens, Kew.

Maslin, B. R. 1988. Should *Acacia* be divided? Bull. Int. Group Stud. Mimosoideae 16: 51–76.

——— & C. H. Stirton. 1997. Generic and infrageneric classification in *Acacia* (Leguminosae: Mimosoideae): A list of critical species on which to build a complete data set. Bull. Int. Group Stud. Mimosoideae 20: 22–41.

———, J. T. Miller & R. J. Bayer. 2000. Molecular systematics of the tribe Acacieae (Leguminosae: Mimosoideae). Pp. 181–200 *in* P. Herendeen & A. Bruneau (editors), Advances in Legume Systematics, 9: Phylogeny. Royal Botanic Gardens, Kew.

———, ——— & D. S. Seigler. 2003. Overview of the generic status of *Acacia* (Leguminosae: Mimosoideae). Austral. Syst. Bot. 16: 1–18.

Miller, J. T. & R. J. Bayer. 2000. Molecular phylogenetics of *Acacia* (Fabaceae: Mimosoideae) based on the chloroplast *trn*K/*mat*K and nuclear histone H3-D DNA sequences. Pp. 181–200 *in* P. S. Herendeen & A. Bruneau (editors), Advances in Legume Systematics. Royal Botanic Gardens, Kew.

——— & ———. 2001. Molecular phylogenetics of *Acacia* (Fabaceae: Mimosoideae) based on chloroplast *mat*K coding sequence and flanking *trn*K intron spacer regions. Amer. J. Bot. 88: 698–706.

——— & ———. 2003. Molecular phylogenetics of *Acacia* subgenera *Acacia* and *Aculeiferum* (Fabaceae: Mimosoideae), based on the chloroplast *mat*K coding sequence and flanking *trn*K intron spacer regions. Austral. Syst. Bot. 16: 27–33.

———, D. Murphy, J. Grimes, P. Ladiges & R. J. Bayer. 2003. Chloroplast DNA evidence for non-monophlyly of derived tribes of the legume subfamily Mimosoideae. Syst. Bot. 38: 558–564.

Olmstead, R. G. & J. D. Palmer. 1994. Chloroplast DNA and systematics: A review of methods and data analysis. Amer. J. Bot. 81: 1205–1224.

Pedley, L. 1978. A revision of *Acacia* Mill. in Queensland. Austrobaileya 1: 75–234.

———. 1986. Derivation and dispersal of *Acacia* (Leguminosae), with particular reference to Australia, and the recognition of *Senegalia* and *Racosperma*. Bot. J. Linn. Soc. 92: 219–254.

Rico-Arce, M. de L. 2001. El género *Acacia* (Leguminosae, Mimosoideae) en el estado de Oaxaca, Mexico. Anales Jard. Bot. Madrid 58: 251–302.

——— & A. Rodríguez. 1998. Flora del Valle de Tehuacán-Cuicatlán. 20: Mimosaceae. Universidad Nacional Autónoma de México, México, D.F.

Robinson, J. & S. A. Harris. 2000. A plastid DNA phylogeny of the genus *Acacia* Miller (Acacieae, Leguminosae). Bot. J. Linn. Soc. 132: 195–222.

Seigler, D. S. & J. E. Ebinger. 2005. New combinations in the genus *Vachellia* (Fabaceae: Mimosoideae) from the New World. Phytologia. 87: 139–178.

———, ——— & J. T. Miller. 2006. The genus *Senegalia* (Fabaceae: Mimosoideae) from the New World. Phytologia. 88: 38–93.

Standley, P. C. 1922. Trees and shrubs of Mexico. Contr. U.S. Natl. Herb. 23: 1–1721.

Swofford, D. 1999. PAUP: Phylogenetic analysis using parsimony, pre-release version 4.02. Laboratory of Molecular Systematics, Smithsonian Institution, Washington, D.C., and Sinauer, Sunderland, Massachusetts.

Vasey, G. & J. N. Rose. 1890. List of plants collected by Dr. Edward Palmer in 1888 in Southern California. Contr. U.S. Natl. Herb. 1(3): 88–89.

Vassal, J. 1972. Apport des recherches ontogéniques et séminologiques à l'étude morphologique, taxonomique et phylogénique du genre *Acacia*. Bull. Soc. Hist. Nat. Toulouse 108: 105–247.

Willdenow, C. L. 1806. Species Plantarum. 4. Berlin.

A New Species of *Phyllanthus* (Phyllanthaceae) from Northeastern Brazil

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Abstract. *Phyllanthus gradyi* M. J. Silva & M. F. Sales from Brazil is described and illustrated, and its affinities are discussed. The new species is included in *Phyllanthus* L. subg. *Botryanthus* G. L. Webster sect. *Elutanthos* Croizat.

Key words: Brazil, Pernambuco, Phyllanthaceae, *Phyllanthus*.

Phyllanthus L. (Phyllanthaceae) is a pantropical genus with more than 800 species. A large majority are herbaceous, with phyllanthoid branching, staminate flowers with a generally segmented glandular disk, pistillate flowers with an entire glandular disk, and diversely sculptured seed coats. The genus is represented by approximately 200 species in the Neotropics, with ca. 107 occurring in Brazil (Webster, 2002). Recent herbarium surveys show that northeastern Brazil has 36 species, mostly herbaceous, growing in open habitats among different vegetation types, or as weeds. During a study of *Phyllanthus* from Pernambuco, a species was encountered with a suite of morphological characteristics that distinguish it from all other Neotropical species of *Phyllanthus*.

Phyllanthus gradyi M. J. Silva & M. F. Sales, sp. nov. TYPE: Brazil. Pernambuco: Mun. Caruaru, Sítio Serra dos Cavalos, 11 Feb. 1995, *S. J. Mayo, I. M. Andrade & M. L. Soares 1002* (holotype, PEUFR; isotypes, DAV, INPA, IPA, UEC). Figure 1.

Haec species arbore, sepalis masculis 4, staminibus 2, *Phyllantho biantherifero* Croizat similis, sed floribus staminatis disco cupuliformi, integro, staminibus liberis, ramulis apice dense tomentoso differt.

Tree 3–6 m, monoecious; stem densely branched; branching non-phyllanthoid; branches cylindrical, gray, densely tomentose on young parts, trichomes rust-colored; stipules 2–2.8 mm long, lanceolate, acuminate, rigid, densely tomentose on external face, glabrous on internal face, midvein evident, margin ciliate, green to vinaceous. Petiole 1.3–2.1 mm long, cylindrical, hirsute; leaf blade 3.5–11 × 1.5–4.5 cm, firmly chartaceous, elliptic to widely elliptic, base obtuse, apex acuminate and mucronate, margin entire, adaxial surface dark green, abaxial surface light green to brown when young, hirsute at base in midvein, brochidodromous, principal and secondary veins prominent only in the abaxial surface. Fascicles axillary, 6 to 13 staminate and 2 to 3 pistillate flowers; bracts 6 to 9 per fascicle, 1.2–2 × 0.5–0.6 mm, widely triangular, external pubescent. Staminate flowers with pedicel 0.7–1.3 cm long, filiform, glabrous, greenish; sepals 4, ovate, obtuse-rounded at the tip, yellowish, midvein evident; disk glandular, cupuliform, fleshy, margin tetragonal; stamens 2, free, facing each other, filaments thickened, anthers with enlarged connective, dehiscing horizontally; pistillate flowers with pedicel 1.2–3.1 cm long, filiform, vinaceous to whitish near receptacle; sepals 6, oblong to lanceolate, apex obtuse to rounded, midvein evident, yellow-green to light green; disk glandular, cupuliform, fleshy, margin irregularly lobed; ovary 1.1–1.2 × 2.5–2.6 mm, oblong; styles 3, free, bifurcate, recurved; stigmas acute. Capsule 2.5–2.6 × 5–5.2 mm, spheroid, styles persistent, fruiting pedicel 2.2–2.8 mm long, glabrous to glabrescent; seeds 3–3.1 × 2.5–2.8 mm, trigonous, areolate.

Distribution and habitat. This species appears to be restricted to humid forests in northeastern Brazil. It has been found in ombrophilous lowland forest fragments (Atlantic Coastal Forest) in the states of Pernambuco and Alagoas, as well as in montane forests ("Brejos de altitude," Sales et al., 1998) within the transition zone between humid forests and semiarid regions at altitudes from 700 to 900 m in Pernambuco. It was found in small populations within the forest interior in shaded, humid areas, growing on clay or sandy-clay soils covered by leaf litter.

Figure 1. *Phyllanthus gradyi* M. J. Silva & M. F. Sales. —A. Flowering branch. —B. Leaf, showing the trichomes at its base. —C. Stipule. —D. Staminate sepal. —E. Pistillate sepal. —F. Staminate flower. —G. Glandular pistillate disk. —H. Pistillate flower. —I. Fruit. Drawn from *S. J. Mayo et al. 1002* (PEUFR).

Phenology. Flowering in September to March; fruiting in November to January.

The suite of characteristics demonstrated by this species, including non-phyllanthoid branching, staminate calyx with four sepals, two free stamens with horizontally dehiscing anthers, entire glandular staminate disk, pistillate calyx with six sepals, and glandular, cupuliform pistillate disk, clearly distin-

guishes this species from other Neotropical taxa. Nonetheless, it does show some affinities with *Phyllanthus biantherifer* Croizat, a Brazilian Amazon species (Croizat, 1944), because both share the same habit and pattern of branching (non-phyllanthoid), the same number of staminate sepals (4) and stamens (2), as well as firmly chartaceous, elliptic, acuminate leaves. However, *P. gradyi* differs from *P. biantherifer* notably by having free stamens, entire staminate disk, and young branches densely tomentose (vs. united stamens, segmented staminate disk, and young branches glabrous in *P. biantherifer*), as well as lanceolate, externally rust-colored tomentose stipules (vs. triangular and glabrous in *P. biantherifer*).

By these characters, *Phyllanthus gradyi* is included in *Phyllanthus* subg. *Botryanthus* G. L. Webster sect. *Elutanthos* Croizat (Phyllanthaceae), which includes approximately 35 Neotropical taxa, characterized principally by their woody habit, non-phyllanthoid branching, lack of cataphylls at the insertion of the branches of the principal stem, as well as horizontal or oblique dehiscence of the anthers (Webster, 1958). However, *P. gradyi* differs from the other taxa of subgenus *Botryanthus*, as these all have 3 connate stamens (2 free stamens in *P. gradyi*), a 6-merous staminate calyx (vs. 4), and partially united styles (vs. free). The type section *Elutanthos* of this subgenus furthermore has a segmented glandular staminate disk (vs. cupuliform).

Etymology. The specific epithet is dedicated to Grady Linder Webster of the University of California at Davis, U.S.A., in recognition of his important contributions to our knowledge of the family Euphorbiaceae s.l., especially the genus *Phyllanthus*.

Paratypes. BRAZIL. **Pernambuco**: Abreu e Lima, *M. J. Silva, M. Oliveira & A. Gomes 557, 558, 559* (PEUFR); Barreiros, *M. J. Silva 539, 540, 541, 542, 545* (PEUFR); Camocin do São Felix, *L. P. Félix & M. de Paula 6491* (PEUFR); Igarassu, *M. J. Silva 372* (PEUFR); Recife, *D. Andrade-Lima 50–454* (IPA); São Lourenço da Mata, *D. B. Pickel 11* (IPA); São Vicente Férrer, *E. M. Nogueira Ferraz 598, 614, 765* (PEUFR); Tamandaré, *M. F. Lucena 811* (PEUFR). **Alagoas**: Ibateguara, *M. Oliveira & A. Grilo 710* (PEUFR, UFP).

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Literature Cited

Croizat, L. 1944. Three new Amazonian species of *Phyllanthus* L. Trop. Woods 78: 5–7.

Sales, M. F., S. J. Mayo & M. J. N. Rodal. 1998. Plantas Vasculares das Florestas Serranas de Pernambuco. Um Checklist da Flora Ameaçada dos Brejos de Altitude, Pernambuco, Brasil. Recife, Imprensa Universitária, Univ. Federal Rural de Pernambuco.

Webster, G. L. 1958. A monographic study of the West Indian species of *Phyllanthus*. J. Arnold Arbor. 39: 49–208.

———. 2002. A synopsis of the Brazilian taxa of *Phyllanthus* section *Phyllanthus* (Euphorbiaceae). Lundellia 5: 1–26.

New Species of Ferns from the Río Cenepa Area, Amazonas, Peru

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Abstract. For the forthcoming florula of the Río Cenepa area in the Department of Amazonas, Peru, the following seven new species of ferns (Pteridophyta) are described: *Asplenium eutecnum* (Aspleniaceae); *Cyathea thelypteroides* and *C. windischiana* (Cyatheaceae); *Megalastrum mollis* (Dryopteridaceae); *Tectaria atropurpurea* and *T. microsora* (Dryopteridaceae); and *Thelypteris berlinii* (Thelypteridaceae). A new combination is made for *Cyathea reginae* (Cyatheaceae), which also occurs in this same area; this was previously recognized as a variety of *Cyathea macrosora* and lacks a name at species rank.

Key words: *Asplenium*, Cenepa, *Cyathea*, ferns, *Megalastrum*, Peru, Pteridophyta, *Tectaria*, *Thelypteris*.

Among ferns (Pteridophyta) received as gift-for-identification from staff of the Missouri Botanical Garden are several novelties, which are here described. Names are needed for species to be included in the forthcoming treatment of the vascular plants of the Río Cenepa region on the eastern slopes of the Andes in the Department of Amazonas, Peru (Vásquez et al., in prep.). This area, which previously has not been well collected, is an especially rich region for ferns. The number of pteridophyte species known from the area of the florula is more than 250, nearly a quarter of the species recorded from Peru in the most recently published flora for the country (Tryon & Stolze, 1994). However, the total for Peru has recently been augmented by 137 species, additions since the Tryon and Stolze flora, largely as a result of collections in the past 10 years (Smith et al., 2005).

Asplenium eutecnum A. R. Smith, sp. nov. TYPE: Peru. Amazonas: Prov. Condorcanqui, Dist. El Cenepa, Com. de Tutino, Pumpu-entsa, 340 m, 26 June 1997, *R. Vásquez 24244 w/ A. Peña, E. Chávez & E. Quiaco* (holotype, HUT; isotypes, MO, NY, UC). Figure 1A.

Asplenio auriculato Swartz affinis, a qua imprimis differt laminis decrescentibus proximaliter, stipitibus brevioribus, pinnis lobatioribus, venis plerumque simplicibus (praeter lobos acroscopicos), apicibus pinnarum obtusis; ab *A. hallii* stipitibus rhachidibusque non lustratis (vs. lustratis), fusco-cinereis (vs. atropurpureis), laminis pinnato-pinnatifidis (vs. pinnato-pinnatisectis, lobo acroscopico saepe ad costam incisis), apicibus laminarum non flagelliformibus, sine gemma ad extremum differt.

Roots wiry, fibrous, giving rise to new plants through root proliferations; rhizomes suberect; rhizome scales dark brown, clathrate, ca. 2–3 × 0.4–0.8 mm, entire; fronds clustered, 8–22 cm long; stipes brown-gray, dull, 0.5–3 cm × 0.5–1 mm, ca. 1/10 of frond length, glabrous or with a few hairlike scales, not or obscurely alate; blades herbaceous, narrowly elliptic, gradually tapered at both ends, 1-pinnate-pinnatifid, 7–20 × 2–5 cm, broadest at the middle, toward the apices with pinnae gradually shorter, narrower, and less deeply lobed, blades lacking flagelliform tips; rachises brownish gray, dull, glabrescent or with sparse hairlike scales, with narrow dark green adaxial wings to ca. 0.3 mm wide; pinnae oblong, ca. 10 to 20 pairs, 1–2.5 × 0.4–1 cm, inequilateral, proximal ones short-stalked to 1 mm, not articulate, excavate basiscopically, truncate and auriculate acroscopically, margins shallowly to deeply lobed, apices obtuse or with a small rounded tooth; veins not or only faintly visible on both sides, mostly unforked except in acroscopic auricles, where they are 2- or 3-forked, tips not visible adaxially; indument abaxially of sparse, tan, appressed, clavate hairs 0.1–0.2 mm long; sori 3 to 6 pairs per pinna, on both sides of midveins; indusia 1.5–5 × 0.4–0.7 mm, margins entire; spores tan, reniform.

Asplenium eutecnum is known from the type and three additional collections; plants are epiphytic, with creeping, proliferous roots suspected of forming colonies by vegetative reproduction. The species epithet is from the Greek eutecknos, blessed with children, alluding to the proliferous nature of the roots that produce new plantlets.

This species appears to be most closely related to *Asplenium auriculatum* Swartz, which differs in having the blades truncate proximally, longer stipes, lowermost pinnae more deflexed and more strongly auriculate, less deeply lobed middle pinnae, veins in pinnae mostly 1-forked on the acroscopic side, and acute pinna apices. *Asplenium auriculatum* is generally found above 800 m (vs. 200–500 m in *A. eutecnum*), over its very broad range, throughout the Neotropics.

Figure 1. —A. Paratype of *Asplenium eutecnum* A. R. Smith (*Díaz et al. 6900*, UC). —B. Isotype of *Megalastrum mollis* A. R. Smith (*van der Werff et al. 16300*, UC).

There is also similarity to *Asplenium hallii* Hooker. Tryon and Stolze (1993) discussed the paratype, *Mexia 6184*, under *A. hallii*, stating this specimen had similarities to *A. auriculatum* (dull rachises, light brown, ovate rhizome scales, and golden tomentose roots), but otherwise matched *A. hallii*. They speculated on a possible hybrid origin for this specimen because of its presumed morphological intermediacy, barren sporangia, and some malformed spores. *Asplenium hallii* differs from *A. eutecnum* in having darker purple-black, lustrous stipes and rachises, more dissected blades, and flagelliform blade tips bearing a proliferous bud at the tip. The spores of *Rodríguez 1545* (UC) are normal in appearance, small (suggesting that the species is a sexual diploid), and with pronounced spine-like projections, most similar to those of *A. repens* Hooker (Tryon & Lugardon, 1991: fig. 212.30), another Peruvian species that has proliferous roots.

Paratypes. PERU. **Amazonas**: Dist. El Cenepa, Com. de Mamayaque, Quebrada en Cerro Sakee-gaig, *E. Rodríguez R. 1545 w/ E. Chavez-Igkuash* (HUT, MO, UC); Prov. Bagua, Dist. Imaza, Com. Aguaruna de Yamayakat, Quebrada Kuzú, *C. Díaz 6900 w/ S. J. Katip & A. Peña* (MO, NY, UC); "Loreto," above Pongo de Manseriche, mouth of Río Santiago, *Y. Mexia 6181* (F, GH, MO, NY, UC, US).

Megalastrum mollis A. R. Smith, sp. nov. TYPE: Peru. Amazonas: Bagua Distr., along rd. from Chiriaco toward Bagua, 21 Mar. 2001, *H. van der Werff 16300 w/ R. Vásquez & B. Gray* (holotype, MO; isotype, UC). Figure 1B.

A *Megalastro hirsutosetoso* (Hieronymus) A. R. Smith & R. C. Moran pilis longiseptatis catenatis paucioribus in costis costulis venisque in superficiebus ambabus folii, laminis pilis glandulosis ca. 0.1 mm longis inter venas in superficiebus ambabus, paleis stipitum rhizomatumque integris differt.

Rhizomes erect, at the tips with dense, linear-lanceolate, dark brown scales; fronds ca. 75 cm long; stipes to ca. 35 cm long, with spreading, dark brown, linear-lanceolate, entire scales mostly ca. 4–10 × 0.2–0.4 mm; blades ca. 42 × 20 cm, barely bipinnate at the bases, becoming pinnate-pinnatifid in the middle, pinnatifid distally, proximal 1 or 2 pairs of pinnae just slightly shorter than more distal ones; rachises similar to the stipes in indument, but with shorter scales; pinnae ca. 10 pairs, the largest 10 × 3.8 cm, broadest at their bases, the proximal 1 to 4 pairs barely pinnate at the bases; segments (pinnules in larger pinnae) adnate, to 25 × 8 mm, the largest ones adjacent to rachis, shallowly lobed, basal basiscopic pinnule of proximal pinnae slightly longer than the opposing acroscopic pinnule; costae and costules abaxially with linear-lanceolate, dark brown, flat, entire scales mostly 2–3 × 0.1–0.2 mm, also with numerous hyaline, septate, catenate hairs mostly 1–2 mm long; laminar tissue between veins abaxially with short glands and hairs mostly 0.1 mm long or less; costae, costules, and veins adaxially with long septate hairs similar to those on abaxial side of blades, the laminar tissue adaxially with numerous, short-stipitate glands less than 0.1 mm long; veins 1-forked, ending short of the margins (viewed adaxially); sori round, often on each veinlet of forking veins, inframedial, exindusiate.

The epithet is taken from the Latin mollis, soft, alluding to the softly pubescent and rather thin (for *Megalastrum*) blades. *Megalastrum mollis* is known only from the type, growing on rocks near waterfall, at 750 m, in relatively intact forest.

The nearest affinities are probably with *Megalastrum hirsutosetosum* (Hieronymus) A. R. Smith & R. C. Moran, from Ecuador and Peru. That species differs in having denser long-septate, non-catenate hairs on the costae, costules, and veins of both blade surfaces; absence of short glandular hairs on the tissue between veins, both blade surfaces; and in the strongly denticulate stipe base and rhizome apex scales. *Megalastrum hirsutosetosum* also appears to have generally larger fronds (mostly 75–110 cm) and more thickly textured blades. Less closely related species, all with somewhat similar blade dissection, are *M. biseriale* (Baker) A. R. Smith & R. C. Moran (Costa Rica to Bolivia), and *M. honestum* (Kunze) A. R. Smith & R. C. Moran (Ecuador and Peru).

Cyathea reginae (P. G. Windisch) A. R. Smith, comb. et stat. nov. Basionym: *Sphaeropteris macrosora* (Baker) P. G. Windisch var. *reginae* P. G. Windisch, Bradea 1: 374. 1973. *Cyathea macrosora* (Baker) Domin var. *reginae* (P. G. Windisch) A. R. Smith, Ann. Missouri Bot. Gard. 77: 250. 1990. TYPE: Colombia. Vaupes: Raudal Jerijerimo, Río Apaporis, *R. E. Schultes & I. Cabrera 13448* (GH).

This species seems closely related to, but readily distinguishable from, both *Cyathea macrosora* (Baker) Domin var. *macrosora* and variety *vaupensis* (P. G. Windisch) A. R. Smith (see Smith, 1995, for comments). *Cyathea reginae* is the only variant in this complex so far known from Peru, and it differs from closely related congeners by the more well-developed, flabellate indusia that curve upward around the base of each sorus. The costal scales in *C. reginae* are light to dark brown, nearly entire, and bullate basally. *Cyathea macrosora* var. *macrosora* is usually exindusiate (all collections seen), or the

indusia are reduced to one or two narrow, barely discernable lobes (Windisch, 1978), and the costae abaxially bear shining, dark brown, mostly flat, stiffly toothed scales. Variety *vaupensis* also lacks indusia (all specimens seen), or indusia are reduced to a few narrow fragments, and it has more numerous, narrower (ca. 0.5–0.8 mm), sharply bicolored stipe base scales than *C. reginae*. Of the three entities, *C. reginae* is the most widespread, occurring in Guayanan Venezuela, Colombia, Peru, and Amazonian Brazil; *C. macrosora* var. *macrosora* is confined to Guayanan Venezuela and adjacent Mt. Roraima in Guyana; and variety *vaupensis*, the least well-known variant, is known from Colombia and Guayanan Venezuela.

Cyathea thelypteroides A. R. Smith, sp. nov. TYPE: Peru. Amazonas: Bagua Distr., upper slopes & summit of Cerro Tayu, 1030 m, 22 Mar. 2001, *H. van der Werff 16323* w/ *R. Vásquez & B. Gray* (holotype, MO; isotype, UC). Figure 2A.

Cyathea phegopteroide (Hooker) Domin et *C. palaciosii* R. C. Moran maxime similis, sed costis venis laminisque interveniis glabris utrinque, paleis pluribus ovatis secus costas costulasque abaxialiter, laminis subcoriaceis, paleis bicoloribus basi stipitum differt.

Plants terrestrial, with very short trunks, old plants with pendent rhizomes to 2 m long; stipes ca. 10 cm × 4 mm, lacking spines or tubercles, scaly throughout, but especially proximally, the scales lustrous, bicolorous, the body dark brown or blackish brown, margins lighter brown (the transition gradual), ovate-lanceolate, mostly 5–7 × 1–2 mm, the margins with cells flaring outward into minute, closely set teeth or papillae, scale tips acute, stipes otherwise glabrous or with minute glands less than 0.1 mm long, lacking small scales (scurf); blades subcoriaceous, pinnate-pinnatifid except at apices, ca. 30 × 11 cm, proximal pinna-pair slightly shorter than the next, blade apices pinnatifid; rachises with scattered scales like those of the stipes but smaller and narrower, tan to brown, concolorous; pinnae sessile or proximal 1 or 2 pairs short-stalked to 2.5 mm, to 5.5 cm × 1.6 mm, incised ca. 3/4 the distance to the costae, basal pair of segments on proximal pinnae slightly reduced, with up to ca. 13 pairs of segments, these 3 mm wide at sinuses, entire, tips rounded; costae abaxially with persistent, lustrous, light brown, ovate, flat scales mostly 1–3 × 1–2 mm, the smaller scales of the costae and most of the scales on the costules strongly inrolled at their bases (bullate), costae lacking hairs or hairs sparse, adaxially the costae with falcate, septate, hyaline hairs, blades otherwise glabrous; veins free, mostly 1-forked, ± glabrous; sori ± medial to inframedial, borne at vein forks; paraphyses moderately numerous, reddish brown, persistent, about the same length as sporangial capsules; indusia absent.

Cyathea thelypteroides is named for its similarity in blade form to many species of *Thelypteris* and is known only from the type.

This species is most similar in blade size and dissection to *Cyathea phegopteroides* (Hooker) Domin and *C. palaciosii* R. C. Moran (Moran, 1994), differing from these in the nearly glabrous blades abaxially and adaxially, the more abundant and ovate scales on the costae and costules abaxially, the subcoriaceous blades, and more strongly bicolored stipe scales. *Cyathea concordia* B. León & R. C. Moran (León & Moran, 1996), known only from the type from Cordillera del Cóndor, Amazonas, Peru, is similar to *C. thelypteroides* in blade size and dissection, but differs in the indusiate sori (indusia sphaeropteroid) placed on mostly simple veins, pubescent veins abaxially, and lighter colored, nearly concolorous stipe base scales. It seems likely that the small-fronded, pinnate-pinnatifid, exindusiate species of *Cyathea*, including *C. thelypteroides*, *C. phegopteroides*, *C. palaciosii*, and *C. bipinnatifida* (Baker) Domin, form a natural group in the Andes.

Cyathea windischiana A. R. Smith, sp. nov. TYPE: Peru. Amazonas: Bagua Distr., Cerro Tayu, ca. 1 hr. from Chiriaco, 800 m, 19 Mar. 2001, *H. van der Werff 16207* w/ *R. Vásquez & B. Gray* (holotype, MO; isotype, UC). Figure 2B.

Ex affinitate *Cyatheae macrocarpae* (C. Presl) Domin indusiis hemiteliis, truncis brevissimis, frondibus minoribus ca. 75 cm longis, laminis pinnatopinnatifidis supra basin, paleis stipitum stramineis vel albidis, marginibus ciliatis apicibus fuscis tortuosis, paleis costarum costularumque pluribus latioribus distinguenda.

Plants terrestrial, with very short trunks; stipes ca. 22 cm × 5 mm, scaly throughout, but especially proximally, the scales whitish to stramineous, mostly 5–12 × 0.5–1.5 mm, the margins with cells flaring outward into hairlike projections, scale tips, especially at stipe bases, often dark castaneous or atropurpureous, or banded with a darkened, often tortuous file(s) of cells in the middle that extends into attenuate or filiform scale tips, stipes otherwise with some matted, flexuous, septate hairs, lacking spines, tubercles, or small scales (scurf); blades pinnate-pinnatifid except at the very base, ca. 50 × 20 cm, proximal 1 or 2 pinna-pairs with the acroscopic segment (pinnule) free or nearly so, sessile or somewhat adnate, to 15 × 7 mm, crenulate, basiscopic segment nearly free and about the same size, blades gradually reduced distally to pinnatifid apices; pinnae

Figure 2. —A. Isotype of *Cyathea thelypteroides* A. R. Smith (*van der Werff et al. 16323*, UC). —B. Isotype of *Cyathea windischiana* A. R. Smith (*van der Werff et al. 16207*, UC).

to ca. 13 × 3.5 cm, long-stalked, the proximal pinnae stalked ca. 12 mm, middle ones ca. 6 mm, broadest at or near the bases, gradually tapered toward the tips, with ca. 15 pairs of segments, these 4–7 mm wide at sinuses, crenulate toward rounded to often acute tips; costae and costules abaxially with persistent, stramineous to tan, lanceolate or ovate-lanceolate, flattish scales to ca. 1.5 × 0.4 mm, scales with bases toothed, often with a filiform tip, adaxially the costae with falcate, acicular, often darkened hairs, blades otherwise glabrous; veins free, 1- or 2-forked in larger segments, simple or 1-forked below the middle in smaller segments, ± glabrous; sori ± medial, on the acroscopic veinlet of a 1-forked vein; paraphyses numerous, in a dense mass, exserted and persistent; indusia brown, hemitelioid, flabellate, entire at the margins, borne at the proximal base of each sorus.

This species is known only from the type and is named for Paulo Gunter Windisch, Brazilian pteridologist who monographed this group of species (Windisch, 1978).

Cyathea windischiana is perhaps related to *C. macrocarpa* (C. Presl) Domin, which is thought to be restricted to the Venezuelan Guayana, Guyana, Surinam, and French Guiana (Windisch, 1978; Smith, 1995), but the relationship is not close. The latter differs in having much larger fronds, trunks probably taller (to 2 m), blades bipinnate-pinnatifid, longer, white or stramineous stipe base scales that lack apical dark mid-bands or tips, and much less numerous, generally narrower, costal and costular scales. There is a more distant relationship of *C. windischiana* to *C. rufescens* (Mettenius ex Kuhn) Domin, known only from near Tarapoto, Peru, and to *C. macrosora*, widespread around the fringes of the Amazon basin (cf. Windisch, 1978). With all of these species, *C. windischiana* corresponds in the reduced, hemitelioid indusia, although in *C. macrosora* the indusia are even more reduced, very small and flabellate or even essentially absent. This group of species also has numerous, exserted soral paraphyses.

Tectaria atropurpurea A. R. Smith, sp. nov. TYPE: Peru. Amazonas: Bagua Distr., Distr. Imaza, Com. Aguaruna de Putuim, 480 m, 19 June 1996, *E. Rodríguez R. 1122* w/ *P. Atamain, E. Chavez-Agkuash & W. Atamain* (holotype, HUT; isotypes, MO, NY not seen, UC). Figure 3A.

A *Tectaria incisa* Cavanilles stipitibus rachidibus costisque atropurpureis, lustratis, pinnis longidecurrentibus praeter pari basali, costis costulis venis interveniisque pilis dispersis septatis 0.2–0.5 mm longis differt.

Rhizomes erect, apices not seen; fronds 60–115 cm long; stipes to 60 cm × 4–7 mm, atropurpureous and lustrous, glabrescent, scales not seen at bases, perhaps abraded, also with dense, often abraded, minute hairs ca. 0.1–0.15 mm long; blades ca. 35–45 × 30 cm, with ca. 3 pairs of lateral pinnae, these strongly ascending ca. 45° to the rachises, 1 or 2 pairs free, distal pairs strongly and long-decurrent onto the rachises; blade apices with 2 to 4 pairs of basal lobes, long-decurrent nearly to adjacent pair of lateral pinnae; rachises with scattered spreading hairs 0.3–0.6 mm long, glabrescent, without scales; buds lacking in axils of pinnae; lateral pinnae to 25 × 8 cm (excluding basal lobes), proximal pair on each blade usually with a single basal basiscopic lobe ca. 10 cm long; costae abaxially atropurpureous, lustrous, costae, costules, veins, and laminar tissue between veins with scattered septate hairs 0.2–0.5 mm long, scales lacking, laminar tissue and veins adaxially glabrous; veins highly reticulate and forming areoles with included, excurrent and recurrent, simple or often forked veinlets, lateral pinnae and apical pinna, as well as larger lobes of these, with ± parallel main lateral veins; sori in 2 regular rows between main lateral veins, to ca. 1.5 mm diam., each with a relatively large, atropurpureous, round-reniform, glabrous, lustrous indusium to 1 mm diam.

The epithet derives from the Latin prefix atro-, dark or black, and purpurea, purple, alluding to the color of the stipes, rachises, and costae. *Tectaria atropurpurea* is known from the type and one other collection from the same area, as well as one collection from eastern Ecuador, all in primary forests.

In the *Pteridophyta of Peru* (Tryon & Stolze, 1991), this will key to *Tectaria incisa* Cavanilles, but *T. atropurpurea* is easily distinguished by the purple-black, burnished stipes, rachises, and costae; the long-decurrent suprabasal pinnae; and by the costae, costules, veins, and tissue between veins usually with scattered, septate hairs 0.2–0.5 mm long. However, the sole collection seen from Ecuador has only sparse hairs abaxially, with hairs less than 0.3 mm long. Both species have sori in two regular rows between the main lateral veins. Several other species of *Tectaria* Cavanilles also have atropurpureous axes, but these all differ in various details: *Tectaria brauniana* (H. Karsten) C. Christensen, from Nicaragua to Bolivia, has free veins, bipinnatifid, more dissected blades, and usually only the stipes and proximal part of rachises atropurpureous; *Tectaria subebenea* (H. Christ) C. Christensen, from Nicaragua to Panama, has 2-pinnate-pinnatifid blades; *T. haynaldii* (Sodiro) C. Christensen, from Ecuador and Colombia, has 4 to

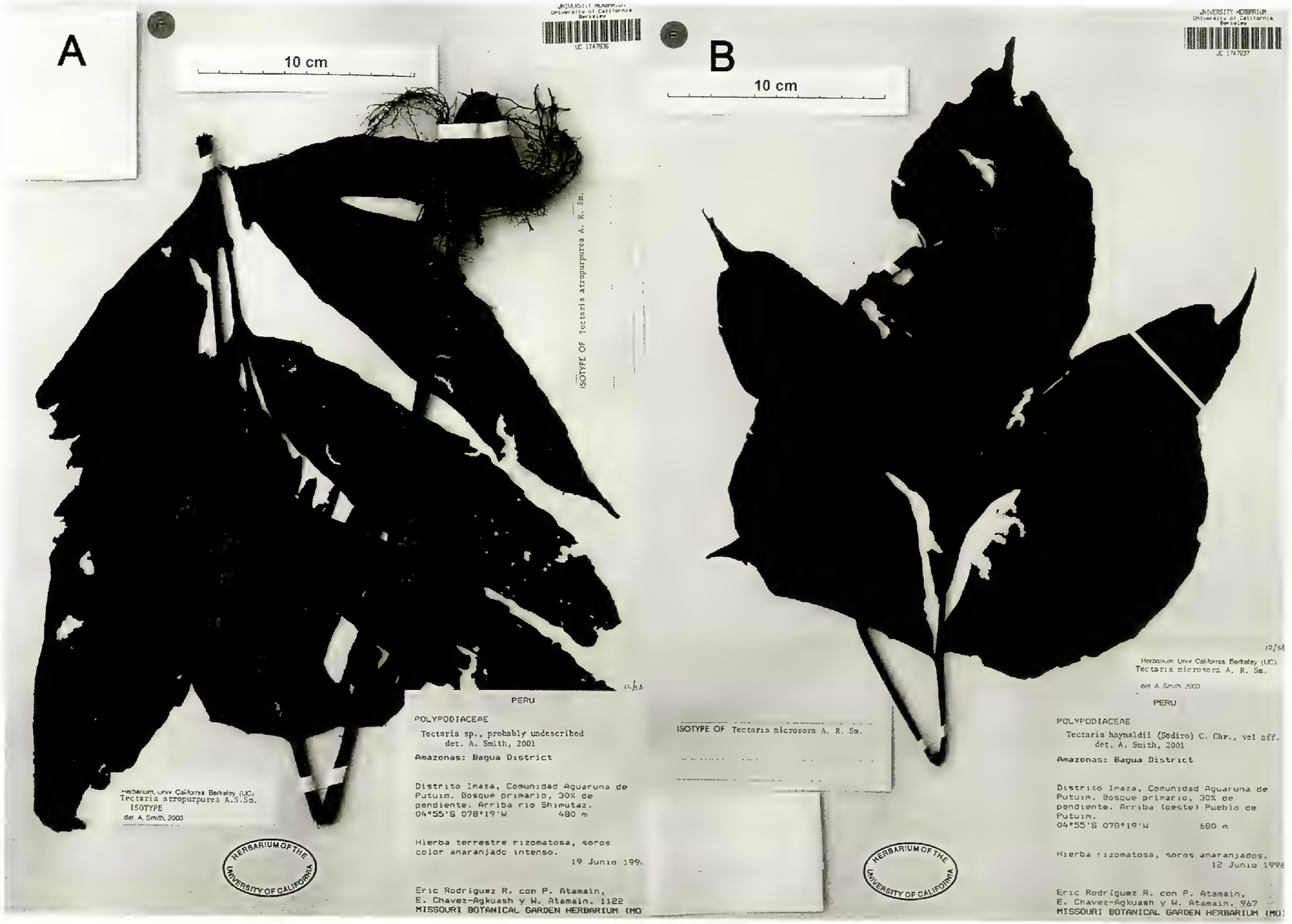

Figure 3. —A. Isotype of *Tectaria atropurpurea* A. R. Smith (*Rodríguez et al. 1122*, UC). —B. Isotype of *Tectaria microsora* A. R. Smith (*Rodríguez R. et al. 967*, UC).

6 rows of very small, exindusiate sori between the main lateral veins, and only 1 or 2 pairs of lateral pinnae; and *T. microsora* A. R. Smith, from Peru, described and contrasted below.

Paratypes. ECUADOR. **Pastaza**: Pastaza Canton, north of Puyo, in park by river, *A. Fay & L. Fay 3738* (MO, UC). PERU. **Amazonas**: Prov. Bagua, Soldado Oliva, carr. entre Bagua–Imaza, 660 m, *C. Díaz 10604* w/ *M. Huamán, F. Salvador, O. Portocarrero & M. Medina* (MO, UC).

Tectaria microsora A. R. Smith, sp. nov. TYPE: Peru. Amazonas: Bagua Distr., Distr. Imaza, Com. Aguaruna de Putuim, 12 June 1996, *E. Rodríguez R. 967* w/ *P. Atamain, E. Chavez-Agkuash & W. Atamain* (holotype, HUT; isotypes, MO, NY not seen, UC). Figure 3B.

A *Tectaria antioquoiana* (Baker) C. Christensen soris exindusiatis vel indusiis parvulis occultis, stipitibus rhachidibusque atropurpureis vel atrobrunneis (vel interdum brunneolis) lustratis, pilis stipitum rhachidum costarum venarum plerumque densis tenuibus 0.1–0.15 mm longis, carentibus gemmis differt.

Rhizomes suberect, scaly at apices; fronds 55–100 cm long; stipes 30–60 cm × 4–7 mm, atropurpureous to dark brown, often lustrous, glabrescent, at bases with sparse, ± appressed, dark brown, ovate-lanceolate scales ca. 2–3 × 0.5–1 mm, these often abraded, also with dense, often abraded, minute hairs ca. 0.1–0.15 mm long; blades 28–40 × 23–30 cm, each with a single pair (less often, 2 pairs) of free lateral pinnae, blade apices with a single pair of large basal lobes, long-decurrent nearly to the adjacent pair of lateral pinnae; rachises light to dark brown, occasionally atropurpureous, with dense spreading thin hairs 0.1–0.15 mm long, sometimes glabrescent, without scales; buds lacking in axils of proximal pinnae; lateral pinnae 17–22 × 6–8 cm (excluding any lobes), usually with a single basal basiscopic lobe 9–12 cm long; costae abaxially atropurpureous to brown-black, occasionally lighter brown, the costae, costules, veins, and sometimes laminar tissue between veins with usually dense hairs 0.1–0.15 mm long, scales lacking, laminar tissue and veins adaxially glabrous; veins highly reticulate and forming areoles with included, excurrent and recurrent, simple or often forked veinlets, the 2 lateral pinnae and apical pinna, as well as large lobes of these, with parallel main lateral veins; sori in 4 to 8 very irregular and hardly discernible rows between main lateral veins, ca. 1 mm diam. or less, seemingly exindusiate or with a ± hidden, marginally fimbriate indusial fragment that is often reduced to a few hairlike structures.

The epithet is taken from the Greek prefix micro-, small, and -sorus, sori. *Tectaria microsora* is known from 13 collections, all from the eastern side of the Ecuadorian and Peruvian Andes, collected in primary forests, at 200 to 800 m elevation.

In the *Pteridophyta of Peru* (Tryon & Stolze, 1991), this will key to *Tectaria antioquoiana* (Baker) C. Christensen, from Nicaragua to Peru. *Tectaria antioquoiana* differs in having indusia usually (always?) present, usually larger sori 1–2 mm in diameter, stipes and rachises dull, stramineous to light brown or purplish brown, and usually by the presence of proliferous buds in the axils of proximal pinnae. The sori in *T. microsora* are unusually small for a species of *Tectaria* (hence the species epithet), seemingly exindusiate or with very small, hidden, fimbriate indusia, and arrayed in 4 to 8 very irregular rows between the main lateral veins, all characteristics distinguishing it from *T. atropurpurea*, newly described above. In soral features, *T. microsora* is similar to *T. draconoptera* (D. C. Eaton) Copeland, from Nicaragua to Bolivia, except that the latter is truly exindusiate and never with small fimbriate indusia. *Tectaria draconoptera* also differs in the pinnatisect blades with all pinnae connected by the alate rachis, lighter brown stipes and rachises, and the glabrous axes and blades. *Tectaria microsora* has a usually dense covering of short, fine hairs 0.1–0.15 mm long on the axes and occasionally also on tissue between the veins abaxially.

Paratypes. ECUADOR: **Napo**: Yasuní Natl. Park, ca. 1.5 km E of bridge over Río Tiputini E of biological station, Transect 2, *R. C. Moran 6105*, w/ *H. Tuomisto, K. Ruokoleinen & A. Poulsen* (NY); Parque Nacional Yasuní, Estación Cientifica Yasuní, por el Río Tiputini, 1.1 km E of biological station, *R. C. Moran 6026*, w/ *H. Tuomisto, K. Ruokoleinen & A. Poulsen* (NY); Aguarico, Reserva Etnica Huaorani, carretera y oleoducto de Maxus en construcción km 92–96, *M. Aulestia & O. Gonti 1982* (MO, NY, UC); Reserva Biológica Jatum Sacha, Río Napo, 8 km abajo de Misahuallí, *C. Cerón 589* (MO, NY, UC). **Pastaza**: Pastaza Canton, 75 km E de Puyo, *E. Gudiño 805*, w/ *C. Quelal & N. Caiga* (MO, NY, UC); Pastaza Canton, Pozo petrolero "Moretecocha" de ARCO, *E. Gudiño 1327* (MO, UC); Pozo petrolero Villano 2 de ARCO, *F. Hurtado 2916* (MO, UC). PERU. **Amazonas**: Prov. Condorcanqui, Distr. El Cenepa, región Nororiental del Marañon, Río Cenepa, Com. Tutino, *R. Vásquez 18404* w/ *C. Diaz, J. Mostacero, F. Mejia & J. Ampam* (MO, NY, UC); Prov. Bagua, Distr. Imaza, region del Marañon, Com. de Yamayakat, Quebrada Kusu-Chapi, Río Marañon, *R. Vásquez 19644* (MO, NY, UC), *E. Rodríguez R. 288* (HUT, MO, UC); Bagua Distr., along road from Chiriaco toward Bagua, *H. van der Werff 16260* (MO, UC); Prov. Bagua, Mesones–Muro Hwy. below Montenegro 18 km, Km 296 E of Olmos, E side of Abra Huahuajin Pass, *P. C. Hutchison & J. K. Wright 3649* (NY, UC). **Pasco**: Oxapampa Prov., Palcazu Valley, Iscozacin, along Palcazu River, *J. Salick 7213* (NY).

Thelypteris berlinii A. R. Smith, sp. nov. TYPE: Peru. Amazonas: [Bagua Distr.], Río Cenepa,

trailside on outskirts of Huampami, 940 ft. [ca. 300 m], *B. Berlin 201* (holotype, UC; isotypes, F, MO).

A *Thelypteride biformata* (Rosenstock) R. M. Tryon pilis brevioribus antrorsis abaxialiter, carentibus pilis stellatis secus costas abaxialiter, frondibus majoribus, pinnis minus incisis, venis pluribus in quoque segmento differt.

Rhizomes unknown, probably suberect; fronds monomorphic; stipes not seen, probably to 50 cm long or more; blades dark green, herbaceous, not verrucose, incomplete, probably to ca. 50 cm long, apices abruptly reduced, somewhat pinna-like, pinnatifid; rachises with dense, stellate hairs ca. 0.1 mm long, lacking long acicular hairs; pinnae 9 or more pairs, to 18 × 3.2 cm, short-stalked to 3 mm, incised ca. 0.5–0.6 the way to the costae, proximal pinnae truncate and only slightly narrowed at their bases, a distal pinna sometimes bearing a small bud in the axil; segments suboblique, subfalcate, rounded at apices, ca. 4–6 mm wide; veins to 18 pairs per segment, lowermost 2 or 3 pairs from adjacent segments connivent at sinuses; indument abaxially of numerous simple, antrorse hairs 0.1–0.3 mm long on costae, costules, and veins, tissue between veins glabrous or with sparse short hairs, stellate hairs lacking except on rachises adaxially and on rachises and bases of costae abaxially, laminar tissue and veins adaxially glabrous; sori medial; indusia round-reniform, tan; sporangia glabrous or with a few minute hairs from the sporangial stalks.

This species is named for the collector, Brent Berlin, who researched the ethnobotany of the Aguaruna Indians from this area and who made some of the earliest collections of plants in the Río Cenepa region. *Thelypteris berlinii* is known only from the holotype and two isotypes, all incomplete specimens lacking the proximal part of the frond and rhizome. This gathering was mentioned by Smith (in Tryon & Stolze, 1992: 66) as a possible undescribed species.

Thelypteris berlinii appears to be most closely related to *T. biformata* (Rosenstock) R. M. Tryon, differing from that in the short, antrorse costal hairs abaxially, the lack of stellate hairs and long acicular hairs on the costae abaxially, larger frond size (probably exceeding 1 m), more shallowly incised pinnae (ca. 1/2 their width, vs. ca. 3/4 their width in *T. biformata*), and more numerous pairs of veins per segment (to 18 pairs). The blade apex is subconform, not quite confluent with the more proximal pinnae, but broader at the base and dissimilar from the lateral pinnae. A small bud has been seen in the axil of a pinna just below the apex in the holotype.

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Literature Cited

León, B. & R. C. Moran. 1996 [1997]. *Cyathea concordia* (Cyatheaceae), a new pinnate-pinnatifid tree fern from the Peruvian/Ecuadorian border. Brittonia 48: 511–513.

Moran, R. C. 1991. Five new species and two new combinations of ferns (Polypodiopsida) from Ecuador. Nordic J. Bot. 15: 49–58.

Smith, A. R. 1995. Cyatheaceae. Pp. 30–43 *in* P. E. Berry, B. K. Holst & K. Yatskievych (editors), Flora of the Venezuelan Guayana, Vol. 2. Pteridophytes, Spermatophytes, Acanthaceae–Araceae. Missouri Botanical Garden Press, St. Louis.

———, B. León, H. Tuomisto, H. van der Werff, R. C. Moran, M. Lehnert & M. Kessler. 2005. New records of pteridophytes for the flora of Peru. Sida 21: 2321–2342.

Tryon, A. F. & B. Lugardon. 1991. Spores of the Pteridophyta. Springer-Verlag, New York.

Tryon, R. M. & R. G. Stolze. 1991. Pteridophyta of Peru. Part IV. 17. Dryopteridaceae. Fieldiana, Bot., n.s. 27: 1–176.

——— & ———. 1992. Pteridophyta of Peru. Part III. 16. Thelypteridaceae. Fieldiana, Bot., n.s. 29: 1–80.

——— & ———. 1993. Pteridophyta of Peru. Part V. 18. Aspleniaceae–21. Polypodiaceae. Fieldiana, Bot., n.s. 29: 1–190.

——— & ———. 1994. Pteridophyta of Peru. Part VI. 22. Marsileaceae–28. Isoetaceae. Fieldiana, Bot., n.s. 34: 1–123.

Windisch, P. G. 1978. *Sphaeropteris* (Cyatheaceae). The systematics of the group of *Sphaeropteris hirsuta*. Mem. New York Bot. Gard. 29: 2–22.

The New Name *Johnstonalia* Substitutes for *Johnstonia* (Rhamnaceae)

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Abstract. The new name *Johnstonalia* Tortosa replaces the illegitimate name *Johnstonia* Tortosa (Rhamnaceae).

Resumen. El nuevo nombre *Johnstonalia* Tortosa reemplaza al nombre ilegítimo *Johnstonia* Tortosa (Rhamnaceae).

Key words: *Johnstonia*, Rhamnaceae.

After I published the new genus *Johnstonia* Tortosa (Rhamnaceae) (Tortosa, 2005), a colleague kindly alerted me to the existence of two previous homonyms: *Johnstonia* A. B. Walkom, Pap. & Proc. Roy. Soc. Tasmania 1924: 79. 1925 (a fossil Pteridophyta, Pecopterides) and *Johnstonia* M. B. Ellis, Mycol. Pap. 125: 13. 1971 (Fungi, Hyphomycetes). By Art. 53.1 of the *International Code of Botanical Nomenclature* (Greuter et al., 2000), my generic name in Rhamnaceae is therefore illegitimate. Herein I propose new names for the genus and its single species.

Johnstonalia Tortosa, nom. nov. Replaced name: *Johnstonia* Tortosa, Novon 15(4): 642. 2005. TYPE: *Johnstonalia axilliflora* (M. C. Johnston) Tortosa.

Johnstonalia axilliflora (M. C. Johnston) Tortosa, nom. nov. Replaced name: *Johnstonia axilliflora* (M. C. Johnston) Tortosa, Novon 15(4): 642. 2005. Basionym: *Gouania axilliflora* M. C. Johnston, Syst. Bot. 13: 493. 1988. TYPE: Peru. Department of Cajamarca, Province of Cajabamba, Condebamba valley, Cajabamba–Cajamarca road, 15 Feb. 1983, *D. N. Smith & R. Vásquez M. 3396* (holotype, TEX; isotypes (not seen) AMAZ, CPUN, HUT, MO, USM).

This Peruvian taxon is distinguished within the Gouanieae Reissek by its absence of tendril shoots and floral disk lobules, as well as by its axillary inflorescences with paired sessile flowers.

Literature Cited

Greuter, W., J. McNeill, F. R. Barrie, H.-M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth. 2000. International Code of Botanical Nomenclature (St. Louis Code). Regnum Vegetabile, 138.

Tortosa, R. D. 2005. *Johnstonia*, a new genus of Gouanieae (Rhamnaceae) from Peru. Novon 15: 642–645.

A New Name in Chinese Bolbitidaceae

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Abstract. During preparation of the account of Bolbitidaceae for the *Flora of China*, volume 3, it was noticed that one species accepted in some earlier treatments is based on an illegitimate combination, *Bolbitis bipinnatifida* (J. Smith) K. Iwatsuki, not *Bolbitis bipinnatifida* (Kuhn) Ching. The following replacement name is proposed here: *Bolbitis longiaurita* F. G. Wang & F. W. Xing.

Key words: Bolbitidaceae, *Bolbitis*, China.

Bolbitis Schott (Bolbitidaceae) is a pantropical fern genus of about 85 known species (Holttum, 1954: 161–170; Tryon & Tryon, 1982). In a revision of the Chinese species, Dong and Zhang (2005) followed Iwatsuki (1959) and Hennipman (1977) in merging *Egenolfia* Schott into *Bolbitis* based on herbarium and field observations and SEM studies of the spores. Dong and Zhang treated 22 species and three hybrids of *Bolbitis* from China.

Bolbitis longiaurita F. G. Wang & F. W. Xing, nom. nov. Replaced name: *Bolbitis bipinnatifida* (J. Smith) K. Iwatsuki, Acta Phytotax. Geobot. 18: 49. 1959, as "*bipinnata*" non *Bolbitis bipinnatifida* (Kuhn) Ching in C. Christensen, Ind. Fil., Suppl. 3: 47. 1934. *Acrostichum appendiculatum* Willdenow var. *costulatum* Hooker, Sp. Fil. 5: 252. 1864, as "*costulata*." *Egenolfia bipinnatifida* J. Smith, Hist. Fil. 132. 1875. TYPE: Burma. Tenasserim: Dawna Range near Moulmein, *C. S. P. Parish 60* (holotype, K).

Egenolfia bipinnatifida J. Smith was a replacement name for *Acrostichum appendiculatum* Willdenow var. *costulatum* Hooker, which was described from Khasia. Ching (1931), in a monograph of the genus *Egenolfia*, recognized it as distinct from *E. intermedia* (J. Smith) Fée, *E. serrulata* (J. Smith) Fée, *E. sinensis* (Baker) Maxon, and *E. tonkinensis* C. Christensen based on its asymmetrically deltoid, large, basal pinnae that are deeply bipinnatifid proximally. Iwatsuki (1959), in an emendation of *Bolbitis*, transferred the species to *B. bipinnatifida* (as "*bipinnata*"). Hennipman (1977) noted that the combination *B. bipinnatifida* (J. Smith) K. Iwatsuki was an illegitimate later homonym, but avoided the issue by combining the taxon under his broadly circumscribed concept of *B. sinensis* (Baker) K. Iwatsuki.

Wang (1999) remarked that *Egenolfia bipinnatifida* is distinctly different from *E. sinensis*. When *E. bipinnatifida* is transferred to *Bolbitis*, this name is illegitimate under Article 53.1 of the St. Louis Code (Greuter et al., 2000) because an earlier homonym exists: *Bolbitis bipinnatifida* (Kuhn) Ching, described from the Seychelles. Therefore, a replacement name for *B. bipinnatifida* is required.

Bolbitis longiaurita is similar to *B. sinensis*, described from Szemao in Yunnan Province, but differs in its unwinged rhachis as well as the base of the two lowermost sterile pinnae asymmetrical, with the basiscopic 2 or 3 lobes undeveloped and the other lobes longer than the acroscopic ones. A large sample of plants of *B. sinensis* have been cultivated at the South China Botanical Garden, and all retained the character of the two lowermost pinnae symmetrical proximally. The Chinese species of *Bolbitis* related to *B. longiaurita* may be distinguished by the key below.

Key to the Chinese Species of *Bolbitis* Related to *B. longiaurita*

1a. Apex of lobes rounded, lobes 0–1 mm apart.
  2a. Rachis with a narrow wing except for the lowest part; base of lowermost sterile pinnae symmetrical . . . . . 1. *B. sinensis*
  2b. Rachis without wing; base of lowermost sterile pinnae asymmetrical . . . . . 2. *B. longiaurita*
1b. Apex of lobes obtusely acute, lobes 2–3 mm apart.
  3a. Stipe and rachis densely scaly; lobes of sterile pinnae falcate, 1–1.5 cm long . . . 3. *B. tonkinensis*
  3b. Stipe and rachis subglabrous; lobes of sterile pinnae triangular, 0.5–0.6 cm long . . . 4. *B. fengiana*

Acknowledgments. We thank the herbaria IBSC, K, KUN, PE, CANT, and SYS for allowing us to examine materials. We gratefully acknowledge the grants received through the major international cooperation of the National Natural Science Foundation "Flora of China" (39899400), the Major Program of National Natural Science Foundation of China (30499340), and Funds of the Chinese Academy of Sciences for Key Topics in Innovation Engineering (KSCX-SW-122).

Literature Cited

Ching, R. C. 1931. On the genus *Egenolfia* Schott. Bull. Fan Mem. Inst. Biol. 2: 297–317.

Dong, S. Y. & X. C. Zhang. 2005. A taxonomic revision of the fern genus *Bolbitis* (Bolbitidaceae) from China. Acta Phytotax. Sin. 43(2): 97–114.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Hennipman, E. 1977. A monograph of the fern genus *Bolbitis* (Lomariopsidaceae). Leiden Bot. Ser. 2: 1–323.

Holttum, R. E. 1954. A Revised Flora of Malaya II. Ferns of Malaya. Government Printing Office, Singapore.

Iwatsuki, K. 1959. Taxonomic studies of Pteridophyta IV. Emendation of *Bolbitis*, with special reference to the Far Eastern species. Acta Phytotax. Geobot. 18: 44–59.

Tryon, R. M. & A. F. Tryon. 1982. Ferns and Allied Plants, with Special Reference to Tropical America. Springer-Verlag, New York.

Wang, C. H. 1999. Bolbitidaceae. Pp. 104–115 *in* S. H. Wu (editor), Flora Reipublicae Popularis Sinicae, Vol. 6(1). Science Press, Beijing.

A New Lectotypification for *Magnolia fistulosa* (Magnoliaceae)

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Abstract. Based on the examination of the original material and protologue, the specimen *Balansa 3884* (P) is designated as the lectotype of *Talauma fistulosa* Finet & Gagnepain, the basionym of *Magnolia fistulosa* (Finet & Gagnepain) Dandy, to supersede under Art. 9.17(b) of the ICBN the earlier designation by Chen and Nooteboom, *Bon 3176*. Two other names, *M. talaumoides* Dandy and *M. phanerophlebia* B. L. Chen, are referred to *M. fistulosa* as new synonyms.

Key words: China, *Magnolia*, Magnoliaceae, *Talauma*, Vietnam.

Finet and Gagnepain (1906) described a new species, *Talauma fistulosa* Finet & Gagnepain, based on three gatherings, two by Benedict Balansa and one by Père Bon from Tonkin, Vietnam. This species was transferred to *Magnolia* L. by Dandy (1928) as *M. fistulosa* (Finet & Gagnepain) Dandy. Chen and Nooteboom (1993) treated *M. fistulosa*, together with *M. paenetalauma* Dandy (1930), *M. talaumoides* Dandy (1930), *M. tenuicarpella* H. T. Chang (1961), and *M. odoratissima* Y. W. Law & R. Z. Zhou (1986), in synonymy under *M. championii* Bentham (1861) and designated *Bon 3176* (at P), as the lectotype of *M. fistulosa*. Chen and Nooteboom (1993) argued that *M. championii* was quite variable in its habit, the shape and size of leaves, the dimensions of the flowers, and carpel numbers, and that these differences were related to geographic distribution. Careful examination of the *Magnolia* collections at IBSC, K, KUN, L, and P has led to the taxonomic opinion that *M. championii* sensu Chen and Nooteboom includes three totally different species concepts: (1) *M. fistulosa*, including *M. talaumoides*, (2) *M. odoratissima*, and (3) *M. championii*, encompassing *M. paenetalauma* and *M. tenuicarpella*.

The lectotype of *Talauma fistulosa*, *Bon 3176*, designated by Chen and Nooteboom (1993) matches the original description of *Magnolia odoratissima* (Law & Zhou, 1986), as well as the holotype of that name (*R. Z. Zhou 0054*, IBSC), in leaf blade shape and texture and in the venation and the slight indument of the abaxial leaf blade surface. Nomenclatural confusion can be resolved and current taxonomic usage can be maintained by superseding Chen and Nooteboom's lectotype of *M. fistulosa* under Art. 9.17(b) of the ICBN (Greuter et al., 2000).

In the protologue of *Talauma fistulosa*, Finet and Gagnepain (1906) cited three syntype specimens from Tonkin, Vietnam: *Balansa 3884* from "Phung-ham," *Balansa 3885* from "mont. Bavi," and *Bon 3176* from "montagnes et chemins" (without precise locality). After careful examination of these specimens, I found that the syntypes *Balansa 3884* and *Balansa 3885* are not conspecific with the lectotype designated by Chen and Nooteboom (1993), *Bon 3176*, which is itself in serious conflict with the protologue. This description (Finet & Gagnepain, 1906: 31) states "*Folia majuscula, glabra, coriacea, lanceolata, basi attenuata, apice cuspidata, supra±nitida, infra reticulata, venis prominentibus; infima petioli pars incrassata, fistulosa, transverse striata, pars suprema teretiuscula, duplo gracilior.*" The specimen *Bon 3176* differs in having the petiole not hollow (vs. hollow in the description), pubescent and not striate (vs. glabrous and transversely striate); leaf blade abaxially slightly pubescent (vs. glabrous), with veins slightly prominent (vs. very prominent), and without (vs. with) reticulate venation; and leaf blade base rounded (vs. cuneate). In contrast, the specimens *Balansa 3884* and *Balansa 3885* correspond very well with the description for *T. fistulosa*. The flower of *Balansa 3884* was dissected and illustrated by Finet and Gagnepain, and therefore *Balansa 3884* (Fig. 1) is selected as lectotype.

Magnolia fistulosa (Finet & Gagnepain) Dandy, Notes Roy. Bot. Gard. Edinburgh 16: 124. 1928. Basionym: *Talauma fistulosa* Finet & Gagnepain, Bull. Soc. Bot. France 52 (Mém. 4): 31. 1906. *Magnolia championii* Bentham subsp. *fistulosa* (Finet & Gagnepain) J. Li, Acta Bot. Yunnan. 19: 133. 1997. TYPE: Vietnam. "Tonkin, Phung-ham, roches calcaire, près de la rive gauche de la Rivière-Noire," 2 May 1888 (fl), *B. Balansa 3884* (lectotype, designated here, P).

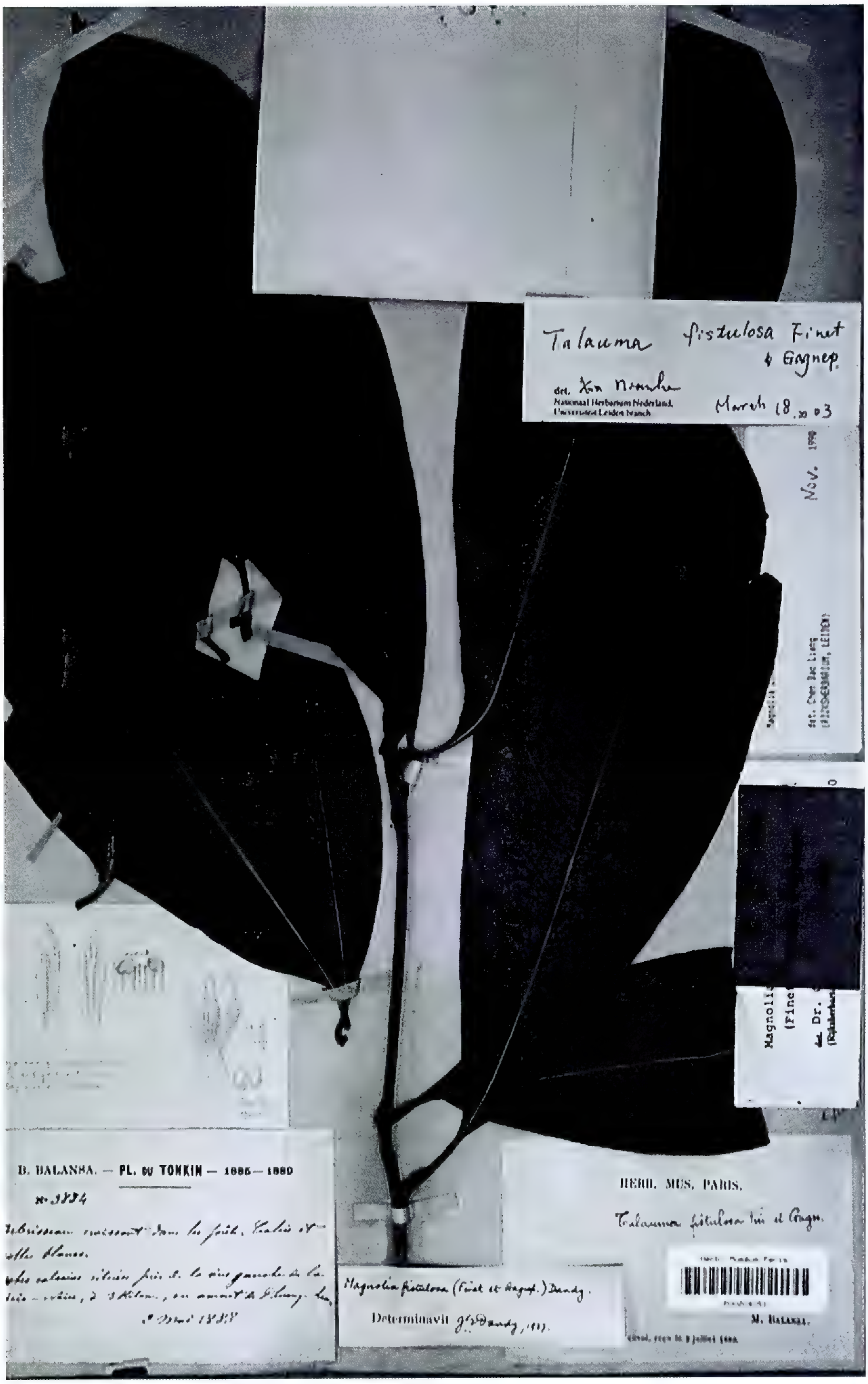

Figure 1. Lectotype specimen of *Talauma fistulosa* Finet & Gagnepain: *Balansa 3884* (P).

Magnolia talaumoides Dandy, J. Bot. 68: 208. 1930. Syn. nov. TYPE: Vietnam. Nha-trang: N of Ninh-hoa, SE flank of La Mère et l'Enfant Mts., 500 m, 16 May 1923 (fl), *E. Poilane 6370* (holotype, P).

Magnolia phanerophlebia B. L. Chen, Acta Sci. Nat. Univ. Sunyatseni 1988(1): 107. 1988. Syn. nov. TYPE: China. Yunnan: Maguan County, Gulinqing, 725 m, 4 Apr. 1987 (fl), *B. L. Chen & C. N. Mai 87T001* (holotype, SYS; isotype, L).

KEY TO *MAGNOLIA FISTULOSA*, *M. ODORATISSIMA*, AND *M. CHAMPIONII*

1. Shrubs; leaves obovate, base cuneate, glabrous, reticulation very prominent abaxially; petioles hollowed, transversely striate; N Vietnam; China (SE Yunnan). . . . . *M. fistulosa*
1'. Shrubs or small trees; leaves usually elliptic, base rounded, more or less hairy abaxially; petioles solid, not striate.
    2. Buds, young branches, abaxial midribs and peduncles white villose; petals up to 5–6 × 2.5–3 cm; China (SE Yunnan, N Vietnam) . . . . . *M. odoratissima*
    2'. Buds, young branches, abaxial midribs, and peduncles pale brown appressed-hairy; petals up to 2.5–4 × 1.5 cm; S & SE China, N Vietnam . . . . . *M. championii*

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Literature Cited

Bentham, G. 1861. Flora hongkongensis. Lovell Reeve, London.

Chang, H. T. 1961. Notulae plantarum austro-sinicarum. Acta Sci. Nat. Univ. Sunyatseni 1961(1): 53–56.

Chen, B. L. & H. P. Nooteboom. 1993. Notes on Magnoliaceae III: The Magnoliaceae of China. Ann. Missouri Bot. Gard. 80: 999–1104.

Dandy, J. E. 1928. New or noteworthy Chinese Magnoliaceae. Notes Roy. Bot. Gard. Edinburgh 16: 123–132.

———. 1930. New Magnolieae from China and Indochina. J. Bot. 68: 204–214.

Finet, E. A. & F. Gagnepain. 1906. Contributions à la flore de l'Asie orientale d'après l'herbarier du museum de Paris. Bull. Soc. Bot. France 52(Mém. 4): 23–54.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Law, Y. W. & R. Z. Zhou. 1986. A new species of Magnoliaceae from Guangtung [sic] and Yunnan, China. Bull. Bot. Res., Harbin 6(2): 139–142.

Cinnamomum purpureum (Lauraceae): A New Species from Guangdong, China

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Abstract. A new species of Lauraceae from Guangdong, China, *Cinnamomum purpureum* H. G. Ye & F. G. Wang, is described and illustrated here. The new species belongs to *Cinnamomum* sect. *Camphora* Meissner and is similar to *Cinnamomum parthenoxylon* (Jack) Meissner in appearance, but differs by the short trunk; the thick leathery leaves with apex obtuse or acute; the branchlets, petioles, costas, young leaves, pedicels, and peduncles purplish red; anthers quadrangular with digitate staminodia; and a fusiform ovary. A key is provided to distinguish the species of *Cinnamomum* in Ehuangzhang Nature Reserve, Guangdong, China.

Key words: China, *Cinnamomum*, Ehuangzhang, Guangdong, Lauraceae, Yangchun.

Cinnamomum Trew is one of the larger genera of Lauraceae, with more than 250 species, and is distributed in tropical Asia and tropical America (Tao, 2001; H. X. Li, 1982). There are about 50 species in China (Tao, 2001), mostly distributed in South China, northward to Shanxi and southern Gansu. Plants of the genus *Cinnamomum* contain diverse essential oils, which can be used extensively for many economic industries such as spices, medicine, foodstuffs, and chemical synthesis. The oils are especially important in the crude spice and medicine industries in China and are welcomed by international markets (Cheng et al., 1997).

The Ehuangzhang Nature Reserve lies east of the Yunkai Mountains, in southeastern Guangdong Province, China. The highest peak, Ehuangzhang, is 1338 m, while the lowest point is 50 m. The Reserve is well covered by natural forests and is an important area to biodiversity conservation.

During a recent scientific survey of the Ehuangzhang Nature Reserve, six species of *Cinnamomum* (*C. burmanni* (C. G. & Th. Nees) Blume, *C. camphora* (L.) Presl, *C. cassia* Presl, *C. parthenoxylon* (Jack) Meissner, *C. validinerve* Hance, as well as the new species), were discovered. The new species is described and illustrated below.

Cinnamomum purpureum H. G. Ye & F. G. Wang, sp. nov. TYPE: China. Guangdong: Yangchun city, Ehuangzhang Mtn., Safflower Pond, ca. 300–800 m, 2 Mar. 2002, *Ye Hua-gu & Ye Yu-shi 6892* (holotype, IBSC; isotypes, IBSC). Figure 1.

Haec species *C. parthenoxyloni* affinis, sed trunco 1.5–4.5 m alto, ramulis et petiolis et costis et foliis juvenilibus et pedicellis pedunculisque purpureo-rubris, foliis apicibus acutis vel obtusis, antheris quadratis, staminibus 4-loculis, superne 2 latrorsis, inferne 2 latrorseo-extrorsis, staminodiis digitiformibus, ovariis fusiformibus, ca. 1.8 mm longis, stylis ca. 0.2 mm longis, differt.

Shrubs or small trees, 1.5–4.5 m tall, 4–10 cm DBH; branchlets, young leaves, pedicels and peduncles purplish red when fresh, and purple-brown when dry. Leaves alternate or pseudoverticillate, thick and leathery, broadly obovate or ovate-elliptic, 7–19 × 4–9.5 cm, apex obtuse or acute, base widely cuneate, glabrous on both surfaces, pinnately veined, with veins prominent on both surfaces, costa purplish red at maturity, lateral nerves 3 to 7 on each side, the axils of basal lateral nerves inconspicuously bullate above and inconspicuously dome-shaped beneath; petiole 2–3.5 cm long, purplish red. Panicle lateral or axillary on lower part of juvenile branches, 7–10 cm long, 4- to 11-flowered, branched, the end of branch being a 1- to 3-flowered cyme. Flowers small, 2.5–3.5 × 4–5.5 mm, green-yellow, pedicels 5–8 mm long; tepals 6, oblong and fleshy, the inner ones spathulate, sparsely puberulous, glabrous outside; fertile stamens 9 in 3 whorls, 4-celled, with the cells biseriate, filaments sparsely puberulous, anthers quadrangular; first and second

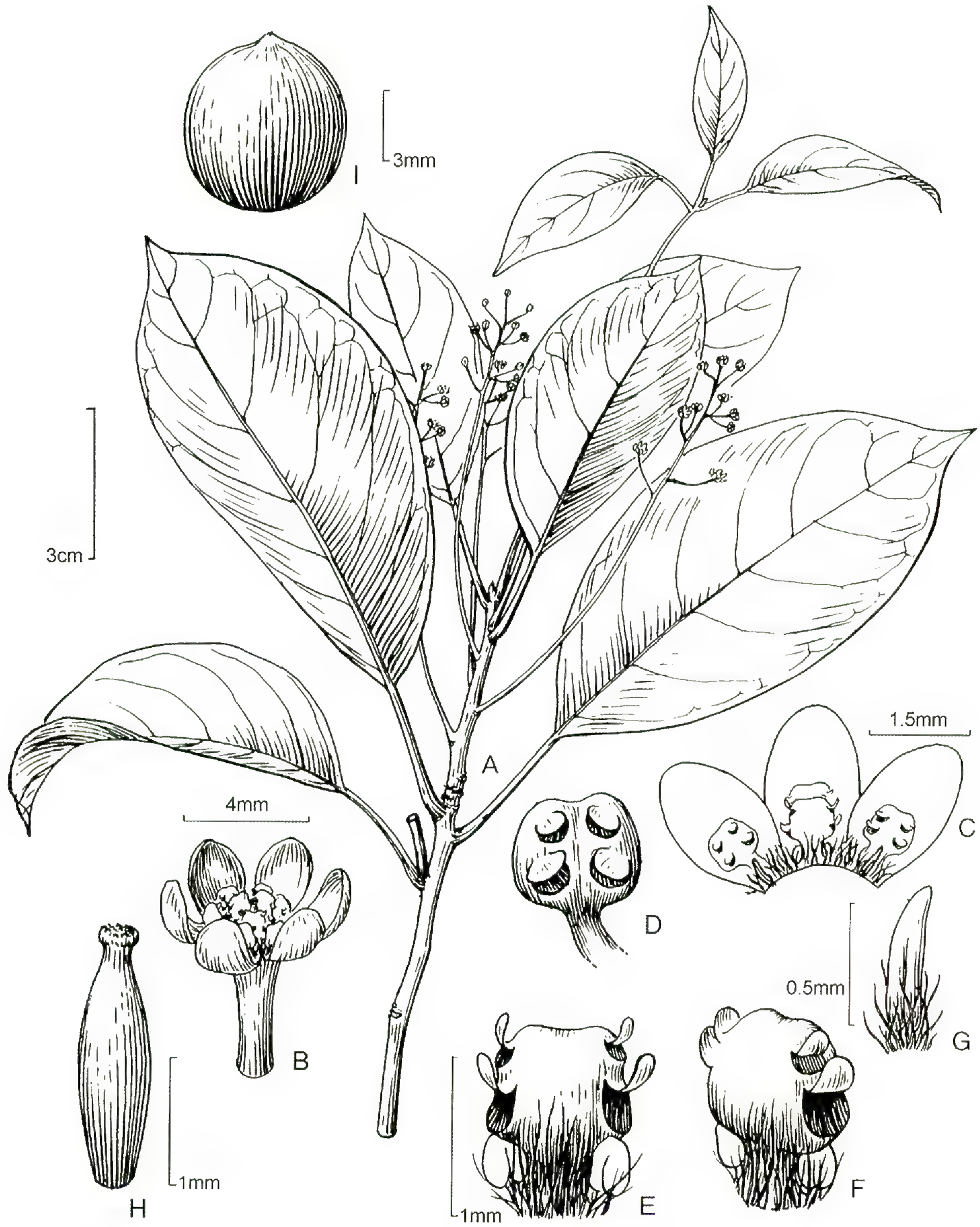

Figure 1. *Cinnamomum purpureum* H. G. Ye & F. G. Wang. —A. Habit. —B. Flower. —C. Longitudinal view of flower, showing three tepals and androecium. —D. Adaxial view of a stamen representative of the first and second whorls. —E, F. Abaxial views of a third whorl stamen with two basal glands. —G. Abaxial view of a staminode. —H. Pistil. —I. Fruit. Drawn from the holotype *Ye Hua-gu & Ye Yu-shi 6892* (IBSC).

whorls of stamens introrse, ca. 1.1 mm long, glands not evident; upper 2 cells of third whorl stamens latrorse, and the lower 2 cells latrorse-extrorse, ca. 1.5 mm long, with 2 basal glands, pubescent abaxially; innermost 3 staminodes ca. 0.7 mm long, digitate, sparsely puberulous at bases; ovary fusiform, 1.5–1.8 mm long, glabrous; style short, ca. 0.2 mm long, stigma disk-shaped. Fruits globose, black at maturity, 6–8 × 6–8 mm; perianth cup narrowly obconical, purplish red basally, 12–15 mm long, 0.8–1 mm wide at base to 3–4 mm wide at apex.

Ecology and distribution. *Cinnamomum purpureum* grows in evergreen forests over granite substrates, at elevations between 300 and 800 m. *Cinnamomum purpureum* is endemic to the Ehuangzhang Mountains, from southwestern Guangdong Province, China.

Phenology. Flowering in February to March; fruiting through May.

Cinnamomum purpureum is closely related to *C. parthenoxylon* (X. W. Li, 1988), which is more broadly distributed in Guangdong, Guangxi, Fujian, Jiangxi,

Hunan, Guizhou, and Yunnan provinces of China (H. X. Li, 1982). *Cinnamomum parthenoxylon* also has alternate and ovate-elliptic leaves, 9 fertile stamens arranged in 3 whorls, 3 staminodes, and globose fruits. However, *C. parthenoxylon* is a larger tree, ca. 10–20 m tall, more than 40 cm DBH; leaves with long-caudate apex; branchlets, young leaves, pedicels, and peduncles gray-green; the anthers are ovoid-globose; the third whorl stamens with extrorse dehiscence; staminodes triangular and cordiform; ovary ovoid and perianth cup 0.8–1 cm long. A morphological comparison between *C. purpureum*, *C. parthenoxylon*, and *C. camphora* is given in Table 1. The species of *Cinnamomum* in Ehuangzhang Nature Reserve can be distinguished by the key below.

Cinnamomum purpureum is currently known only from Safflower Pond of Ehuangzhang Mountains, and the population there is small, consisting of about 750 individuals. As such, it should be considered Vulnerable category under the IUCN Red List Categories and Criteria (IUCN, 2001; Hu et al., 2003). Additional ecological and biological study should be taken toward effective conservation measures.

Paratypes. CHINA. **Guangdong:** Yangchun city, Ehuangzhang Mtn., Safflower Pond, 550 m, *Ye Hua-gu & Wang Fa-guo 5398* (IBSC, MO), 600 m, *Ye Hua-gu & Ye Yu-shi 5438* (IBSC).

Key to Species of *Cinnamomum* in Ehuangzhang Nature Reserve, Guangdong, China

1a. Bud scales distinct, imbricate; leaves alternate, pinninerved, sub-triplinerved or rarely trinerved; perianth lobes deciduous when in fruit.
  2a. Shrub or small tree; branchlets, petioles, costa, young leaves, pedicel, and peduncles purplish red; anthers quadrangular, staminoids digitate; ovary fusiform . . . . . *C. purpureum*
  2b. Tree; branchlets, leaves, pedicel, and peduncles gray-green; anthers ovate or oblong, staminoids not digitate; ovary ovoid.
    3a. Leaves always glaucous beneath when dry, triplinerved, the axils of lateral nerves and veins conspicuously dome-shaped beneath . . . . . *C. camphora*
    3b. Leaves greenish or glaucous-green beneath when dry, generally pinninerved, the axils of lateral nerves only conspicuously or inconspicuously dome-shaped beneath . . . . . *C. parthenoxylon*
1b. Buds naked or bud scales indistinct; leaves opposite or subopposite, trinerved or triplinerved; perianth lobes persistent when in fruit.
  4a. Leaves sparsely yellow-tomentellate beneath . . . . . *C. cassia*
  4b. Leaves glabrous.
    5a. Leaves elliptic, reddish green and glaucous beneath; perianth cup in fruit truncate, undulate or irregularly dentate on the margin teeth. . . . . *C. validinerve*
    5b. Leaves ovate, oblong to lanceolate, glaucous-green beneath; perianth cup in fruit regularly dentate on the margin, the teeth truncate, rounded or acute at the apex . . . . . *C. burmanni*

Table 1. Diagnostic characters among *Cinnamomum purpureum*, *C. parthenoxylon*, and *C. camphora*.

Characters	*C. purpureum*	*C. parthenoxylon*	*C. camphora*
Height of trunk	1.5–4.5 m	10–20 m	10–30 m
Diameter of trunk	0.04–0.1 m	0.1–2.5 m	0.8–3 m
Branchlets	purplish red	gray-green	gray-green
Leaves	broadly obovate or ovate-elliptic, 7–19 × 4–9.5 cm, apex obtuse or acute; young leaves purplish red; petiole purplish red	usually elliptic-ovate or narrowly elliptic-ovate, 6–12 × 3–6 cm, apex long-caudate to 2 cm long; young leaves green; petiole green	ovate-elliptic, 6–12 × 2.5–5.5 cm, apex acute, young leaves green; petiole green
Nerve	pinnately veined, the axils of basal lateral nerves inconspicuously bullate above; costa purplish red at maturity	pinnately veined, the axils of lateral nerves inconspicuously bullate above; costa green	usually triplinerved, the axils of lateral nerves and veins conspicuously bullate above; costa green
Inflorescence	pedicel and peduncles purplish red	pedicel and peduncles gray-green	pedicel and peduncles gray-green
Anther shape	quadrangular	ovate or oblong	oblong
Dehiscence of cells	upper 2 cells of third whorl stamens latrorse, and the lower 2 cells latrorse-extrorse	cells of third whorl stamens with extrorse dehiscence	cells of third whorl stamens with extrorse dehiscence
Staminoid shape	digitate	triangular and cordiform	sagittate
Ovary	fusiform, 1.5–1.8 mm long	ovoid, 0.8–1 mm long	ovoid, 0.8–1 mm long
Style	short, ca. 0.2 mm long	curved, about 1 mm long	about 1 mm long
Perianth cup	narrowly obconical, 12–15 mm long	narrowly obconical, 0.8–1 cm long	cupuliform, ca. 5 mm long

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Literature Cited

Cheng, B. Q., X. J. Yu, J. K. Ding & H. D. Sun. 1997. Pp. 1–20 *in* *Cinnamomum* Plant Resources and Their Aromatic Constituents in China. Yunnan Science & Technology Press, Kunming.

Hu, Q. M., N. H. Xia, D. L. Wu, F. W. Xing, C. C. L. Patrick & K. L. Yip. 2003. Pp. 220–222 *in* Rare and Precious Plants of Hong Kong. Agriculture, Fisheries and Conservation Department, Hong Kong.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission, Gland, Switzerland.

Li, H. X. 1982. Lauraceae. Pp. 1–463 *in* Flora Reipublicae Popularis Sinicae 31. Science Press, Beijing.

Li, X. W. 1988. Some notes on the Lauraceae of China. Acta Bot. Yunnan. 10(4): 489–492.

Tao, G. F. 2001. *Cinnamomum* (Lauraceae) resources in Hubei Province, China. J. Wuhan Bot. Res. 19(6): 489–496.

Impatiens ×*pacifica* (Balsaminaceae), a New Hybrid Jewelweed from the Pacific Northwest Coast of North America

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Abstract. *Impatiens* ×*pacifica* Zika (Balsaminaceae), a natural spontaneous hybrid, is described from western North America, in coastal Oregon and Washington. A key is provided, and the hybrid is compared with its parents, the common introduction *Impatiens capensis* Meerburgh and the uncommon native *I. ecalcarata* Blankinship. Hybrid flowers are intermediate in markings and morphology between those of the parents. *Impatiens* ×*pacifica* differs from *I. ecalcarata* in its spotted corolla and from *I. capensis* in its spurless flowers.

Key words: Balsaminaceae, hybrid, *Impatiens*, Oregon, Washington.

The genus *Impatiens* L. (Balsaminaceae) has five members in North America, and roughly 900 species worldwide (Yuan et al., 2004). There are two native species in eastern North America, *I. capensis* Meerburgh and *I. pallida* Nuttall. In Canada, *I. capensis* ranges west to the District of Mackenzie (Cody, 1996) and Alberta (Moss & Packer, 1983). Three other indigenous North American species are found in the Pacific Northwest. *Impatiens noli-tangere* L. is circumboreal, ranging south along the Canadian coast in British Columbia and reaching the contiguous United States only in northernmost Washington state. *Impatiens aurella* Rydberg is a regional endemic, found between Montana and the east slope of the Cascade Range. *Impatiens ecalcarata* Blankinship has a similar range, but populations extend locally to the Pacific coast.

Impatiens capensis was recently introduced to northwestern North America, in Oregon, Washington, and British Columbia (Ornduff, 1966; Zika, in press). Beginning in the 1950s it spread across the lowlands of the Pacific Northwest, west of the Cascade Range, ultimately colonizing most localities with *I. ecalcarata*. Along the lower Columbia River drainage in Oregon and Washington, the two species now share the same wetland habitat and phenology, resulting in a hybrid first discovered by Ornduff (1967). This hybrid, with floral morphology intermediate between the parents, is known from eight counties. A number of recent authors remark on the hybrid (e.g., Thomas, 1984; Maxwell, 1991; Buckingham et al., 1995; Jacobson, 2001; Kozloff, 2005). With more than 50 vouchered populations, the hybrid is common enough to deserve a binomial, provided here.

Impatiens ×pacifica Zika, sp. nov. TYPE: U.S.A. Oregon: Columbia Co., S shore of Columbia River at bridge to Anunde Island, Point Adams Rd. at River Front Rd., spurless, 4 m, 46°8′N, 123°14′W, 23 Sep. 2003, *P. F. Zika 19118* (holotype, WTU; isotypes, CAN, CAS, DAO, GH, ID, K, MICH, MO, MONT, MONTU, NEU, NY, OSC, PRA, RM, RSA, UBC, UC, US, V, WS). Figure 1.

Hybrid formula: *Impatiens capensis* Meerburgh forma *capensis* × *I. ecalcarata* Blankinship.

Ab *Impatiente ecalcarata* Blankinship floribus maculatis differt, ab *Impatiente capense* Meerburgh floribus non cornutis.

Annual, often supported by a small prop root system, erect or slightly creeping and rooting at the lowest nodes; succulent, fistulose, slightly glaucous, glabrous, to 214 cm tall; nodes swollen, sometimes highly branched. *Leaves* alternate above first few nodes, narrowly ovate, ovate, or nearly elliptic, 2.7–10.2 × 1.5–4.7 cm, coarsely serrate or crenate, 1 to 3 teeth per cm at midleaf, the teeth mucronate; leaves acute, base cuneate, paler beneath, pinnately veined; petioles 2–48 mm long. *Inflorescence* spreading to pendant, axillary; bracts narrowly lanceolate to linear, 3 mm long; *chasmogamous flowers* 1 to 4 in an open corymb, zygomorphic, bilaterally symmetrical, described after resupination following Grey-Wilson (1980). Outer (non-saccate) *sepals* 2, pale green in bud, reticulate veined, asymmetric, cuspidate, midvein deep green. Lower sepal 1, saccate, enlarged and colored, petal-like; *petals* 3, upper lip yellow-orange; lateral petals bilobed (by fusion of 2 petals), forming a lower lip, claw twisted at throat; in two forms, but never on the same plant, *spurless floral form* yellow-orange, saccate sepal pouch-like, obtuse, diameter slightly greater than length; distal margins convex,

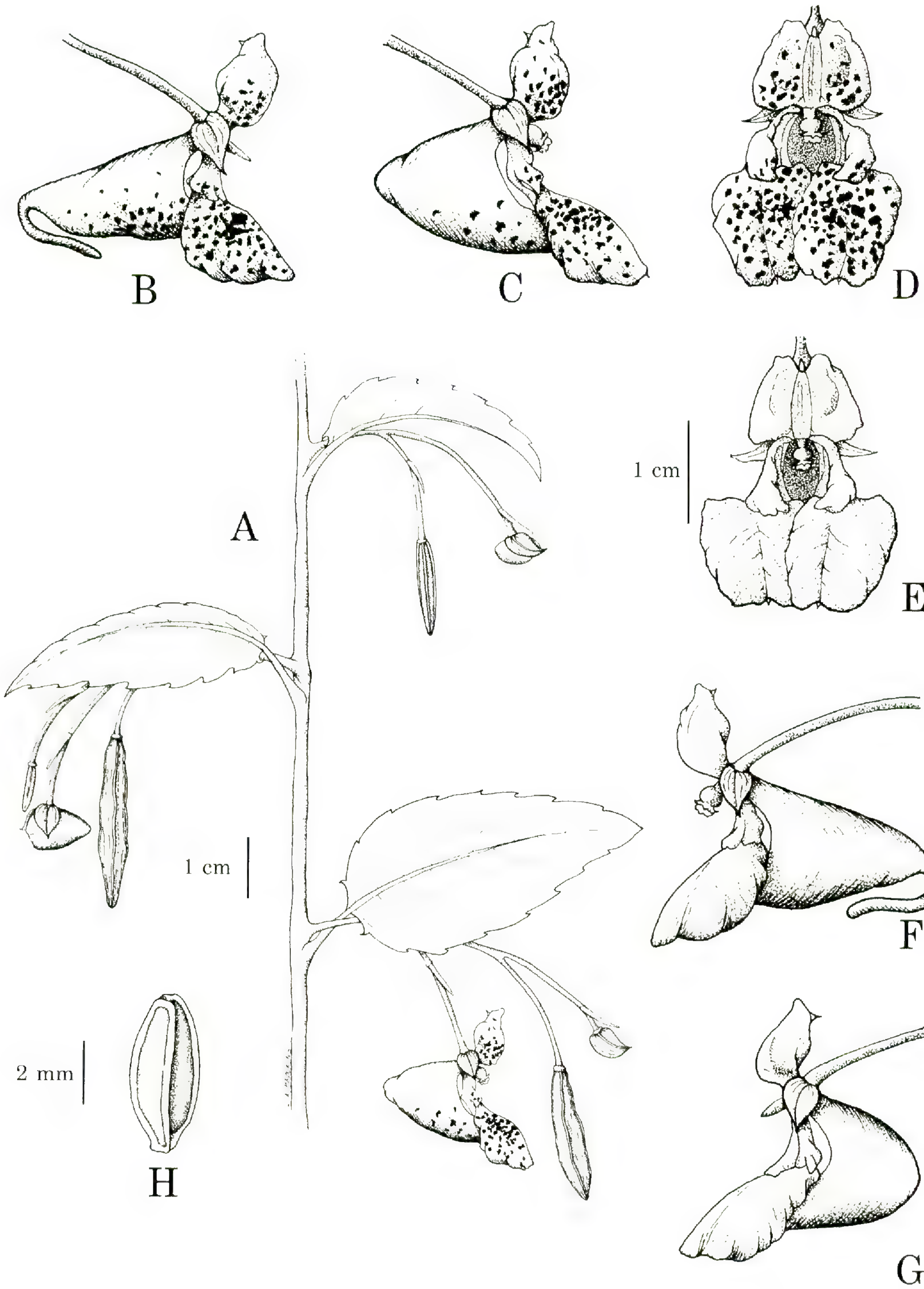

Figure 1. Species of *Impatiens*. —A. *I.* ×*pacifica* Zika, habit. —B. *I. capensis* Meerburgh, flower, lateral view. —C, D. *I.* ×*pacifica*, spotted spurless form. —C. Flower, lateral view. —D. Flower, front view. —E, F. *I.* ×*pacifica*, spotless spurred form. —E. Flower, front view. —F. Flower, lateral view. —G. *I. ecalcarata* Blankinship, flower, lateral view. —H. *I.* ×*pacifica*, seed. Drawn by Linda A. Brooking. A, C, D, H drawn from *Zika 19201* (WTU); B from *Zika 19008* (WTU); E, F from *Zika 19178* (WTU); G from *Zika 19181* (WTU).

lacking spur, with dark orange spots or blotches (nectar guides) scattered to dense on corolla lip, more sparsely on dorsal and ventral surfaces of saccate sepal, usually more heavily spotted ventrally; length of tube from pedicel to distal end of saccate sepal 7–18 mm; *spurred floral form* yellow-orange, spotless, saccate sepal abruptly tapered to essentially linear recurved spur, length of tube from pedicel to base of spur 14–18 mm long; *stamens* 5, filaments free for 1/2 their length; anthers white, joined in a ring around the ovary apex; *ovary* superior, 5-carpellate, placentation axile, style 1. *Cleistogamous flowers* inconspicuous, narrowly ovoid, ca. 2 mm long, whitish green, on short pedicels in shaded lower axils or at tips of late season shoots. *Pedicels* slender, elongating in fruit to 28 mm. *Fruits* green, narrowly oblong, narrowly oblanceolate, or clavate, 25–32 × 3–6 mm (dried), valves 5, fleshy, elastic; seeds 1 to 7, explosively released, 4.8–6.3 × 2.2–3.2 mm, green, mottled with black or entirely black, oblong to narrowly ovate or narrowly elliptic, seed with low ridges united at base to form a nearly cubical abrupt short stipe, testa finely reticulate. Chromosome number unknown.

Floral morphology. The taxonomy of indigenous North American *Impatiens* relies entirely on the morphology of chasmogamous flowers. *Impatiens* ×*pacifica* has two chasmogamous floral forms, recognizable by the presence or absence of a nectar-bearing spur on the saccate sepal. The different floral forms are always on separate plants. Spurless *Impatiens* are unusual. They evolved independently in Madagascar (Fischer & Rahelivololona, 2002; Yuan et al., 2004) and in North America, where spurless *I.* ×*pacifica* has corolla spots and is easily distinguished from *I. ecalcarata*, which lacks spots on its spurless flowers. Spurred *I.* ×*pacifica* lacks spots, and so is separable from *I. noli-tangere* and forms of *I. capensis* and *I. aurella* with spotted corollas (St. John, 1929, 1937). Plants of *I. aurella* have a smaller saccate sepal than *I.* ×*pacifica*.

Impatiens capensis f. *immaculata* (Weatherby) Fernald & B. G. Schubert is a rare form with flowers that lack spots due to a recessive gene for anthocyanin production (Nozzolillo, 1983; Nozzolillo & Thie, 1983; Schoen & Latta, 1989), and thus all flowers on an individual are spotless. Specimens of this form from coastal Washington closely resemble spurred *I.* ×*pacifica* in the herbarium. How can they be distinguished? Ornduff (1967) noted the two are separable by pollen analysis, with hybrids showing lowered pollen viability compared to pure populations of *I. capensis*. In nature, population differences are evident. *Impatiens capensis* f. *immaculata* occurs scattered among much greater numbers of typically spotted *I. capensis* f. *capensis*, in large monospecific stands, and every flower bears spurs. In sharp contrast, at the 52 populations of *I.* ×*pacifica* I visited, both floral forms of *I.* ×*pacifica* were prominent among the parents in mixed populations, and spurless plants were always present to reliably indicate hybridization.

Hybridization. *Impatiens* ×*pacifica* is believed to be a hybrid based on three lines of evidence. First, every known site with a mixed population of *I. capensis* and *I. ecalcarata* has produced *I.* ×*pacifica*. Second, Ornduff (1967) noted that pollen viability was lowered when the two parental species grew together. Third, as shown in Figure 1, the two floral forms of *I.* ×*pacifica* are intermediate between the flowers of *I. capensis* and *I. ecalcarata*. Both parents have the same chromosome number, $n = 10$ (Chinnappa & Gill, 1974), and no obvious genetic, phenological, or pollinator barrier to crossing (Randall & Hilu, 1990; Zika, in press). Presumably *I.* ×*pacifica* populations represent F_1 hybrids, but no molecular studies have investigated how frequently the hybrids are formed or the extent of backcrossing. *Impatiens* ×*pacifica* appears to be a stable hybrid; populations have been present in Clatsop Co., Oregon, since 1957 (*Hotchkiss 7538*, WTU). Substantial numbers of hybrids were present each year I studied the King County population, from 2002 to 2005. There are no obvious transitional floral forms between those illustrated, suggesting further introgression is cryptic if present. The two floral forms of *I.* ×*pacifica* suggest pollen donation by different parents, which should be tested with artificial crosses or molecular analysis.

Distribution and habitat. *Impatiens* ×*pacifica* is found west of the Cascade Range in Oregon and Washington, in the United States (Fig. 2). Most populations are in a 75-km corridor between Longview, Washington, and Astoria, Oregon, along the lower Columbia River and its tributaries. The mapped range is a close mimic of the distribution of *I. ecalcarata* west of the Cascade Range. All *I.* ×*pacifica* populations were found at elevations below 100 m. Like both parents, *Impatiens* ×*pacifica* flowers between mid-August and early November. The seeds, which float, mature from late August through early November, until senescence or frost.

Impatiens ×*pacifica* is found in several wetland and riparian types, intermingled with its parents. Habitats include shady floodplain forest, sloughs, pond shores, riverbanks, and sunny roadside ditches or canals, but generally with native wetland associates. The largest populations are from sunny freshwater intertidal marshes along the lower Columbia River, where the lower stems are inundated twice daily, the

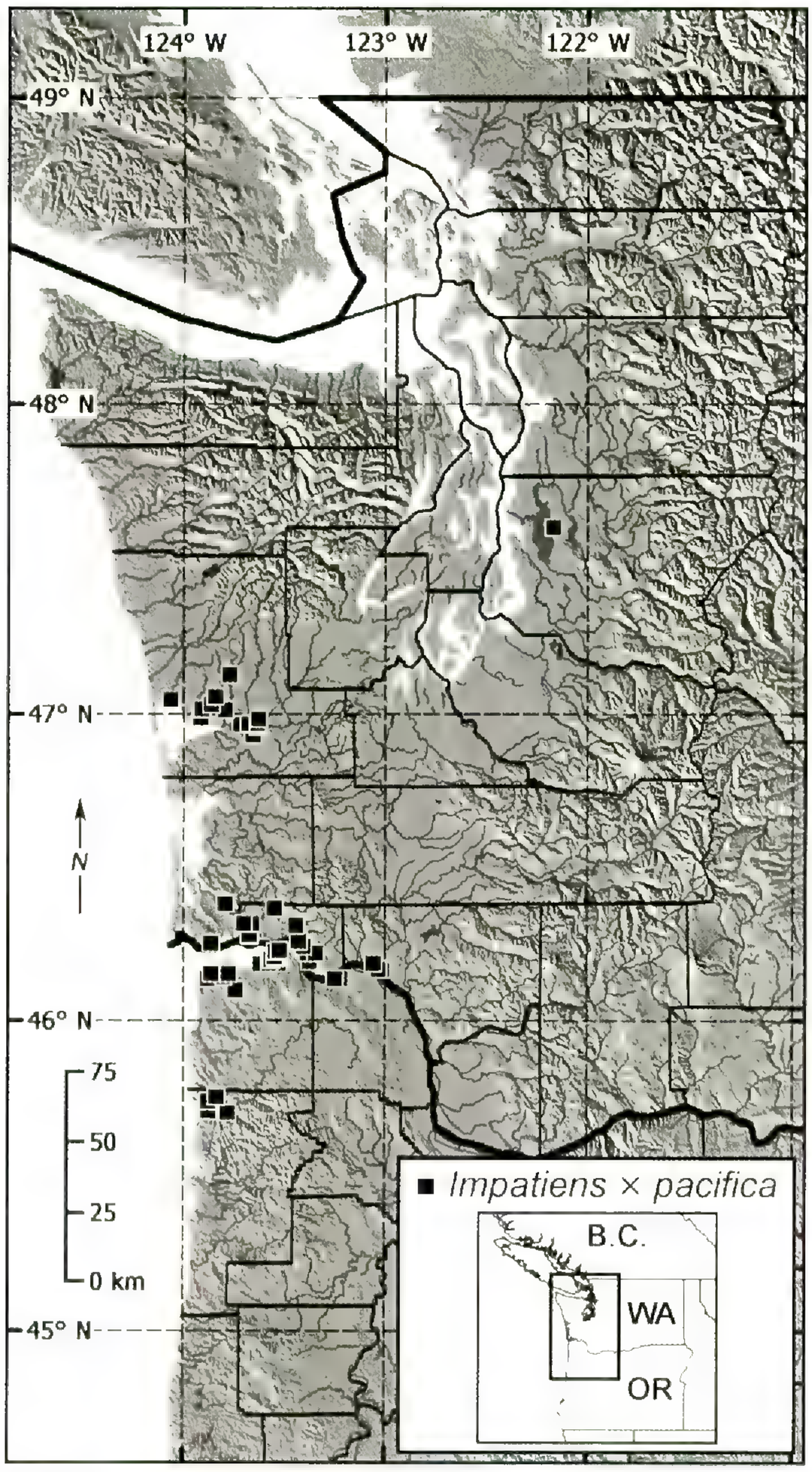

Figure 2. Distribution of collections of *Impatiens* ×*pacifica* in the Pacific Northwest. Map courtesy of Ben S. Legler.

substrate is muddy (Thomas, 1984), and the parents are common associates. Occasionally *I.* ×*pacifica* grows with another introduced jewelweed, *I. glandulifera* Royle. All the *Impatiens* taxa, including *I.* ×*pacifica*, are noteworthy annuals for their ability to successfully reproduce in dense stands of non-native *Phalaris arundinacea* L.

Conservation concerns. *Impatiens ecalcarata* is recognized as a rare species in parts of its range east of the Cascade Range. In British Columbia it is on the blue list of special concern (Douglas et al., 1998; British Columbia Conservation Data Centre, 2006). Montana considers it a species of potential concern (Montana Natural Heritage Program, 2003). West of the Cascade Range, I found *I. ecalcarata* was uncommon and may be genetically threatened by the introduction of *I. capensis*, which leads to frequent hybridization and the formation of *I.* ×*pacifica* (Levin & Anderson, 1970; Levin et al., 1996; Rhymer & Simberloff, 1996; Vilà et al., 2000; Zika, in press).

Paratypes. U.S.A. **Oregon:** Clatsop Co., near N shore of Klaskanine River, *P. F. Zika 20048* (OSC); Youngs River 6.4 air km SE of Grant Island, *P. F. Zika 20050* (UBC); Fort Clatsop Nat. Memorial, *L. Johnson 53a* (herbarium of Ft. Clatsop Nat. Mon., Nat. Park Service); 1 air km SE of mouth of Wallooskee River, *P. F. Zika 20040* (WTU); 3 air km SE of Daggett Point on Youngs River, *P. F. Zika 20051* (K); near mouth of Lewis and Clark River, *P. F. Zika 20058* (RM); near Ivy Station, *V. Hotchkiss 7538* (WTU); head of South Fork of Blind Slough, S shore Columbia River, *P. F. Zika 19182* (WTU); 0.5 air km SE of Knappa, *P. F. Zika 19206* (WTU); 1.6 air km NE of Knappa, *P. F. Zika 19201* (OSC, WTU); Blind Slough, S of Long Island, *P. F. Zika 19185* (WTU); Blind Slough, Columbia River, *P. F. Zika 19200* (WTU); Prairie Channel, Columbia River, S of Horseshoe Island, *P. F. Zika 19196* (WTU); E of Long Island, 1 km NE of Brownsmead, *P. F. Zika 19189* (WTU); Columbia Co., Columbia River S of Wallace Island, *P. F. Zika 19122* (WTU, NY); Tillamook Co., N bank, Nehalem River, *P. F. Zika 2076* (NEU, RSA, WTU); E end of Nehalem Bay, *P. F. Zika 20081* (US); near NW bank of North Fork Nehalem River, *P. F. Zika 20065* (OSC, WTU); Big Rockheap Creek, *Zika 20071* (MO, NEU, WTU). **Washington:** Cowlitz Co., Solo Slough, *P. F. Zika 19009* (UC, WTU); SE of Willow Grove, by Fisher Island, *P. F. Zika 19022* (WTU); N bank of Columbia River, slough N of Willow Grove, *P. F. Zika 19158* (NY, UC, WTU); Grays Harbor Co., roadside in swamp, *V. Buckingham 3179* (herbarium of Olympic Nat. Park, Port Angeles, Washington, hereafter abbreviated onp); Peels Slough, N side of Chehalis River, *P. F. Zika 20227* (OSC); Elliott Slough, *P. F. Zika 20212* (MONTU); N shore of Chehalis River, *P. F. Zika 20231* (MONT); SE side of Central Park, *P. F. Zika 20238* (GH); 2 air km W of Montesano, *P. F. Zika 20216* (MO, UC); W end of Hoquiam, *P. F. Zika 20282* (RM); Wishkah River floodplain, *P. F. Zika 20250* (UBC); Hoquiam River, 5 air km SSE of New London, *P. F. Zika 20268* (US, UVIC); East Fork Hoquiam River, *P. F. Zika 20261* (RSA); Burrows-Sadie Hill Road, *V. Buckingham 3182* (onp); Middle Fork Wishkah River, *P. F. Zika 20251* (MICH, NY); King Co., Bellevue, *P. F. Zika 17783 & F. Weinmann* (WTU); Pacific Co., 1 air km NE of Point Elice, *P. F. Zika 19212* (WTU); Naselle, *P. F. Zika 19217 & C. Maxwell* (WTU); Wahkiakum Co., S shore of Cathlamet Channel, Puget Island, *P. F. Zika 19178* (WTU); 1.6 air km N of Cathlamet, *P. F. Zika 19156* (MO, WTU); S bank of Elochoman River, 3 air km NE of Cathlamet, *P. F. Zika 20340* (GH, WTU); NE end of Hunting Islands, *P. F. Zika 19123* (MO, WTU); E shore Grays Bay, near Yellow Bluff, *C. L. Maxwell 299, 300* (WTU); SE end of Grays Bay, near Pigeon Bluff, *P. F. Zika 19137 & C. Maxwell* (WTU); Skamokawa Creek, 1 air km NNE of Skamokawa, *P. F. Zika 20311* (CAN); Grays River, 1.6 air km NE of mouth, *P. F. Zika 19130 & C. Maxwell* (WTU); mouth of Deep River, *P. F. Zika 19150 & C. Maxwell* (WTU); Klints Creek, 7 air km NE of Rosburg, *P. F. Zika 20318* (UC).

Key to taxa. A key is provided for indigenous and introduced *Impatiens* in the Pacific Northwest. It requires fresh chasmogamous flowers, or well-pressed dried flowers, with notes on color, spotting, and the shape of the saccate sepal. Vegetative and fruiting characters are not diagnostic with the native North American taxa. All floral parts are described after resupination, following Grey-Wilson (1980).

KEY TO *IMPATIENS* IN THE PACIFIC NORTHWEST

1a. Ovaries, fruits, stems, and pedicels pubescent, often densely so; cultivated . . . . . *I. balsamina* L.
1b. Ovaries, fruits, stems, and pedicels glabrous; native or naturalized.
2a. Leaves finely, sharply, and evenly serrate, with (4)5 to 9 teeth per cm at mid-margin on well-developed leaves; Eurasian introductions.
3a. Flowers pale yellow; distance from pedicel attachment to spur base (not tip) 1–5 mm; most of seed surface covered with numerous prominent raised ridges composed of columnar parallel cells . . . . . *I. parviflora* DC.
3b. Flowers purple to pink-purple, or white; distance between pedicel and spur base 10–21 mm, most of seed surface exposed, smooth to slightly granular in longitudinal rows, prominent raised columnar ridges poorly developed, sparse or basal.
4a. Mid-stem and upper leaves usually opposite or whorled; spur recurved, 5–6 mm long; saccate sepal abruptly tapered to spur; distance between pedicel and spur base 18–21 mm . . . . . *I. glandulifera*
4b. Mid-stem and upper leaves alternate; spur nearly straight, 10–15 mm long; saccate sepal gradually tapered to spur; distance between pedicel and spur base 10–15 mm . . . . . *I. balfourii* Hooker f.
2b. Leaves entire or coarsely, irregularly crenate or sparsely blunt-serrate, with 1 or 2(3) teeth per cm at mid-margin on well-developed leaves; indigenous North American taxa and their hybrids.
5a. Flowers (saccate sepals) lacking spur.
6a. Flowers spotted . . . . . *I.* ×*pacifica*
6b. Flowers lacking spots . . . *I. ecalcarata*
5b. Flowers (saccate sepals) spurred.
7a. Flowers lacking spots.
8a. Spurs straight, not hooked or curved; distance between pedicel and spur 1–5 mm; most of seed surface covered with numerous prominent raised ridges composed of columnar parallel cells . . . . . . unusual leaf forms of *I. parviflora*
8b. Spurs hooked, curved, or reflexed; distance between pedicel and spur 9–18 mm; seed surface smooth to granular, heavy veins at corners but surface never obscured with numerous columnar ridges.
9a. Flowers small, 9–14 mm between pedicel and spur base; proximal lobe of lateral petals often diverging or ascending; saccate sepal often with gradual taper to spur; east of Cascade Range . . . . . *I. aurella*
9b. Flowers larger, 14–19 mm between pedicel and spur base; proximal lobe of lateral petals descending, oriented parallel to body of lateral petals; saccate sepal usually with abrupt taper to spur; west of Cascade Range.
10a. Pollen viability averaging 79% (Ornduff, 1967); in mixed stands of *I. capensis*, *I. ecalcarata*, and spurless *I.* ×*pacifica* . . . *I.* ×*pacifica*
10b. Pollen viability averaging 97%; spurless plants absent in population. . . . . *I. capensis* f. *immaculata*
7b. Flowers spotted.
11a. Flowers small, 8–14 mm between pedicel and spur base; east of the Cascade Range . . . . . *I. aurella*
11b. Flowers larger, 15–20 mm between pedicel and spur base; coastal lowlands west of Cascade Range.
12a. Flowers pale yellow; taper to spur gradual and concave; spotting fine, concentrated on dorsal side of saccate sepal; spots brownish purple or dark purple, sparse . . . . *I. noli-tangere*
12b. Flowers deep orange or yellowish orange; taper to spur abrupt and convex; spotting coarse, concentrated on ventral side of saccate sepal; spots dark orange to reddish orange (rarely pink), spots often concentrated or coalescing on lateral petals at throat of flower . . . . . *I. capensis*

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Angeles, Washington (abbreviated as "onp"); The Evergreen State College in Olympia, Washington; Slater Museum of Natural History in Tacoma, Washington; Pacific Lutheran University in Tacoma, Washington; and U.S. Forest Service herbaria in Olympia and Colville, Washington. I am grateful to Linda A. Brooking for creating the line drawings, Ben S. Legler for the map, and to Art Gilman for translating the Latin diagnosis. I appreciate discussions of the hybrid with Ed Alverson, Arthur Jacobson, Ting Lan, and David Giblin, and help with fieldwork from Fred Weinmann.

Literature Cited

British Columbia Conservation Data Centre. 2006. BC species and ecosystem explorer. Ecosystems Branch, Ministry of Environment, British Columbia Provincial Government, Victoria, BC. URL: <http://srmapps.gov.bc.ca/apps/eswp/>, accessed 2 August 2006.

Buckingham, N. M., E. G. Schreiner, T. N. Kaye, J. E. Burger & E. L. Tisch. 1995. Flora of the Olympic Peninsula. Northwest Interpretive Association and the Washington Native Plant Society, Seattle.

Chinnappa, C. C. & L. S. Gill. 1974. Chromosome numbers from pollen in some North American *Impatiens* (Balsaminaceae). Canad. J. Bot. 52: 2637–2639.

Cody, W. J. 1996. Flora of the Yukon Territory. NRC Research Press, Ottawa.

Douglas, G. W., G. B. Straley, D. Meidinger & J. Pojar (editors). 1998. Illustrated Flora of British Columbia, Vol. 2. Dicotyledons (Balsaminaceae through Cuscutaceae). British Columbia Ministry of Environment, Lands and Parks, Ministry of Forests, Victoria.

Fischer, E. & M. E. Rahelivololona. 2002. New taxa of *Impatiens* (Balsaminaceae) from Madagascar. I. Adansonia 24: 271–294.

Grey-Wilson, C. 1980. *Impatiens* of Africa. Morphology, Pollination and Pollinators, Ecology, Phytogeography, Hybridisation, Keys and a Systematic Treatment of all African Species, with a Note on Collecting and Cultivation. A. A. Balkema, Rotterdam.

Jacobson, A. L. 2001. Wild Plants of Greater Seattle. Published by the author, Seattle.

Kozloff, E. N. 2005. Plants of Western Oregon, Washington and British Columbia. Timber Press, Portland.

Levin, D. A. & W. W. Anderson. 1970. Competition for pollinators between simultaneously flowering species. Amer. Naturalist 104: 455–467.

———, J. Francisco-Ortega & R. K. Jansen. 1996. Hybridization and the extinction of rare plants. Conservation Biol. 10: 10–16.

Maxwell, C. L. 1991. Vascular flora of the Willapa Hills and lower Columbia River area of southwest Washington. Douglasia Occas. Pap. 4: 27–76.

Montana Natural Heritage Program. 2003. Plant species of concern. The Montana Natural Heritage Program, Montana State Library, Helena, Montana. URL: <http://nhp.nris.state.mt.us/plants/reports/2003 PSoC List.pdf>, accessed 2 August 2006.

Moss, E. H. & J. G. Packer. 1983. Flora of Alberta: A Manual of Flowering Plants, Conifers, Ferns and Fern Allies Found Growing without Cultivation in the Province of Alberta, Canada. 2nd ed. Univ. Toronto Press, Toronto.

Nozzolillo, C. 1983. Observations on anthocyanin pigmentation in seedlings and mature plants of *Impatiens capensis* Meerb. and its possible role as a determinant of floral form. Canad. J. Bot. 61: 633–638.

——— & I. Thie. 1983. Aspects of germination of *Impatiens capensis* Meerb., formae *capensis* and *immaculata*, and *I. pallida* Nutt. Bull. Torrey Bot. Club 110: 335–344.

Ornduff, R. 1966. *Impatiens capensis* in Oregon: Native or naturalized? Leafl. W. Bot. 10: 317–319.

———. 1967. Hybridization and regional variation in Pacific Northwestern *Impatiens* (Balsaminaceae). Brittonia 19: 122–128.

Randall, J. L. & K. W. Hilu. 1990. Interference through improper pollen transfer in mixed stands of *Impatiens capensis* and *I. pallida* (Balsaminaceae). Amer. J. Bot. 77: 939–944.

Rhymer, J. M. & D. Simberloff. 1996. Extinction by hybridization and introgression. Annual Rev. Ecol. Syst. 27: 83–109.

Schoen, D. J. & R. G. Latta. 1989. Spatial autocorrelation of genotypes in populations of *Impatiens pallida* and *Impatiens capensis*. Heredity 63: 181–189.

St. John, H. 1929. New and noteworthy northwestern plants. Part 3. Res. Stud. State Coll. Wash. 1: 90–112.

———. 1937. Flora of Southeastern Washington and of Adjacent Idaho. Students Book Corp., Pullman, Washington.

Thomas, D. W. 1984. The vascular flora of the Columbia River estuary. Wasmann J. Biol. 42: 92–106.

Vilà, M., E. Weber & C. M. D'Antonio. 2000. Conservation implications of invasion by plant hybridization. Biol. Invas. 2: 207–217.

Yuan, Y.-M., Y. Song, K. Geuten, E. Rahelivololona, S. Wohlhauser, E. Fischer, E. Smets & P. Küpfer. 2004. Phylogeny and biogeography of Balsaminaceae inferred from ITS sequences. Taxon 53: 391–403.

Zika, P. F. 2006. The status of *Impatiens capensis* (Balsaminaceae) on the Pacific Northwest coast. J. Torrey Bot. Soc. 133(4). In press.

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Una Nueva Variedad de *Lophostachys guatemalensis* (Acanthaceae) de Interesante Distribución Geográfica

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Resumen. Se registra la presencia de *Lophostachys guatemalensis* Donnell Smith por primera vez de México. La especie fue colectada en varias localidades de selva mediana subperennifolia de la región Costa del estado de Oaxaca. Los especímenes encontrados presentan dimensiones algo mayores en los caracteres florales y cápsulas que los descritos previamente, y como presentan una notable disyunción, se propone una variedad para las poblaciones de Oaxaca: *L. guatemalensis* var. *chontalensis* S. Acosta Castellanos & A. Saynes V.

Abstract. *Lophostachys guatemalensis* Donnell Smith is recorded for the first time from Mexico. The species was collected in several localities of tropical semi-evergreen forest from the coast of the state of Oaxaca. The specimens found here have flower characters and capsules somewhat longer than those previously described for the species. Because they show a noteworthy disjunction, a new variety, *L. guatemalensis* var. *chontalensis* S. Acosta Castellanos & A. Saynes V., is proposed for the Oaxacan populations.

Key words: Acanthaceae, *Lophostachys*, Mexico, Oaxaca.

Del género *Lophostachys* Pohl (Acanthaceae) se reconocen 20 especies (Daniel, 1993; Nelson, 1993), cinco de ellas provienen de la zona del sur de México a Centroamérica y el resto principalmente de Brasil, con una especie compartida en Perú, Bolivia y el norte de Argentina

Acosta (1985) registró la presencia de este género principalmente sudamericano en México y enfatizó la notable disyunción de sus especies. Daniel (1993) realizó una sinopsis de las especies conocidas del género en México y Centroamérica y registró tres especies en México (Veracruz, Oaxaca y Chiapas) y una en Guatemala. Casi al mismo tiempo Nelson (1993), basado en un espécimen sin flores, describió una especie de Honduras. Si bien muchos de los caracteres propios del género *Lophostachys* se presentan en sus flores (corola, estambres y polen), la estructura de su cáliz y cápsula indicarían que se trata de una especie válida, cercana a *L. uxpanapensis* S. Acosta Castellanos.

Durante las salidas de campo para realizar el inventario de la Flora de la Costa de Oaxaca, estudio llevado a cabo por la Sociedad para el Estudio de los Recursos Bióticos de Oaxaca, A.C., fueron colectados ejemplares de una especie de *Lophostachys* que no

había sido registrada de México y es el objeto del presente artículo.

Lophostachys guatemalensis Donnell Smith var. **chontalensis** S. Acosta Castellanos & A. Saynes V., var. nov. TIPO: México. Oaxaca: Dto. Pochutla, Mpio. de San Miguel del Puerto. Puente Río San Lorenzo, 2.8 km al W, sobre la brecha a Montecarlo, 275 m, 15 58′52″N, 96 5′50″W, 14 enero 2001, *S. Salas M. con M. Elorsa y L. Schibli 3636* (holotipo, OAX; isotipos, CAS, ENCB, MEXU, MO).

A varietate typica bracteis, bracteolis, calyce, corolla et capsula aliquandum majoribus, segmentis calycinis anticis posticisque extus glanduloso-pubescentibus differt. Habitat in sylvis usque ad 890 m supra mare, ad declivitatem Pacificam Oaxacanam limitata.

Subarbusto de cerca de 1 m de altura, muy ramificado desde la base; ramas erguidas muy esparcidamente puberulentas a glabras, las jóvenes algo cuadrangulares, pubescencia de tricomas simples, dispuesta principalmente en líneas opuestas. Hojas opuestas, pecioladas, peciolos de 10–40 mm, puberulentos a glabros; láminas hasta de 153 × 80 mm, lanceoladas a ovado-lanceoladas, agudas a acuminadas en el ápice, largamente decurrentes sobre el peciolo, enteras a muy ligeramente repandas, las hojas del mismo par subiguales, haz y envés glabrescentes, la pubescencia dispuesta principalmente sobre las nervaduras, el envés más pálido; las nervaduras laterales son subopuestas en la base y alternas hacia el ápice, de 6 a 8 pares. Inflorescencias terminales y axilares, cortamente pedunculadas, pedúnculos hasta de 1–3 mm, espigadas, las espigas rara vez ramificadas, secundifloras, de 15–45 mm; pedúnculos más o menos cuadrangulares, densamente pubescentes sobre toda su superficie, tricomas simples; brácteas algo falcado-lanceoladas, verdosas o con tintes rojizos hacia el margen, ca. 8–12 × 1.8–3.3 mm, con 5 a 7 nervaduras casi paralelas, ápice agudo, borde entero, ciliadas, pubescentes principalmente sobre las nervaduras o glabras; bractéolas asimétricas, angostamente espatuladas, con tintes rojizos o rosados, de 7–11 × 1–2.4 mm, con 3 nervaduras principales, ápice acuminado, borde entero, ciliadas, pubescentes principalmente sobre las nervaduras o glabras. Flores subsésiles; segmentos del cáliz 4, rojizos, los lóbulos anterior y posterior externos, espatulado-obovados, cuspidado-acuminados, reticulado-venosos, de 14–17 × 6–8 mm, el lóbulo anterior, bífido, dividido hasta más allá de la mitad de su longitud (8–11 mm desde el ápice), los segmentos resultantes asimétricamente espatulados, parte externa pubescente con tricomas simples y glandular-estipitados entremezclados, parte interna eglandular, los segmentos laterales internos, linear-subulados, de 7–8.5 × 0.6–0.8 mm, densamente pubescentes, la parte interna con tricomas simples y la externa con tricomas glandulares estipitados hacia el ápice; corola bilabiada, roja, superficie externa pubescente, con tricomas eglandulares, superficie interna glabra a pubescente en el cuarto inferior, de 32.2–38.6 mm; tubo de la corola de 12.7–16 mm y de 2–2.4 mm de diám.; el labio superior subtriangular-ovado truncado, someramente bífido (dientes < 1 mm), de 8–9.2 × 7.3–7.9 mm, el labio inferior de 9.4–10.7 mm, trilobulado, los lóbulos subiguales, elíptico elongados, de 5–6.8 × 3.4–4.2 mm, el lóbulo medio algo más angosto (ca. 3 mm); estambres 4, didínamos, insertos por debajo de la parte media de la longitud de la corola (12.8–14.1 mm desde la base), los superiores casi tan largos como la corola y los inferiores algo más cortos; filamentos glabros, los filamentos de los estambres superiores de 13.5–18 mm, con las anteras biloculadas, lóculos similares paralelos, múticos, de 2.5–3 mm, los filamentos de los estambres inferiores de 9–14.5 mm, con las anteras uniloculadas, de 1.8–2.8 mm; disco cupular, de color verdoso, de cerca de 1.4 mm de diám. y 1 mm de alto; ovario pubescente, con 2 óvulos por lóculo; estilo glabro, filiforme, hasta de 29 mm; estigma subcapitado. Cápsula de 13–14.4 × ca. 3 mm, elipsoidal, apiculada, comprimida, pubescente, oscura; semillas no vistas.

Fenología. Se encontró en floración en enero a marzo y en fructificación en junio.

Distribución y hábitat. Se ha encontrado solamente en selva mediana subperennifolia de la vertiente del Pacífico del estado de Oaxaca en altitudes de 275 a 890 m.

Etimología. El nombre de la variedad alude al grupo étnico que habita en la zona de colecta de los especímenes estudiados: Chontales.

Como se puede apreciar en la Tabla 1 y en la descripción precedente, las principales diferencias con el isotipo de *Lophostachys guatemalensis* Donnell Smith (espécimen *Heyde et Lux 4382*, depositado en US) son el mayor tamaño de las brácteas, bractéolas, cáliz, flores y cápsulas, la pubescencia glandular más densa en la parte externa de los segmentos anterior y posterior del cáliz y la división más profunda del mismo segmento anterior, características que podrían ampliar solamente el intervalo de variación de la especie, pero éstas aunadas a la disyunción mostrada por nuestros ejemplares amerita asignarle la categoría de variedad.

Tabla 1. Principales diferencias entre las dos variedades de *Lophostachys guatemalensis* en Centroamérica.

	Longitud del cáliz (lóbulos anterior y posterior)	Lóbulo anterior del cáliz dividido desde el ápice hasta:	Longitud de corola	Longitud de cápsula
L. guatemalensis var. *guatemalensis*	10–15 mm	6–8.5 mm	28–33 mm	9.5–12 mm
L. guatemalensis var. *chontalensis*	14–17 mm	8–11 mm	32.2–38.6 mm	13–14.4 mm

Las especies de *Lophostachys* de México y Centroamérica que son todas de distribución alopátrica, muestran patrones de distribución interesantes. Resulta que los ejemplares encontrados corresponden a *L. guatemalensis*, especie anteriormente conocida sólo de Guatemala y El Salvador, zona alejada del Istmo de Tehuantepec. Antes solamente se conocía que *L. uxpanapensis* era la única especie del género que había logrado traspasar esta barrera geográfica, por lo que la nueva localidad resulta ser la más occidental del género.

Lophostachys guatemalensis var. *guatemalensis* es la única que se conoce de hábitats relativamente secos (el espécimen de El Salvador: *J. L. Linares 5589* (EAP, MEXU) fue colectado en encinar perturbado con *Pinus* L. a 1120 m de altitud), mientras que *L. guatemalensis* var. *chontalensis* se encontró en una selva mediana subperennifolia como los otros taxa del género que se han encontrado en ambientes húmedos. *Lophostachys uxpanapensis*, *L. chiapensis* S. Acosta Castellanos y *L. zunigae* C. Nelson son propios de selva alta perennifolia y *L. soconuscana* T. F. Daniel de bosque mesófilo. Una característica común de las especies del género presentes en México y Centroamérica es que todas son de flores rojas (a excepción quizás de *L. zunigae* cuyas flores no se conocen), por lo que tal vez sean visitadas por un polinizador similar. Se sabe al menos por los registros de herbario que *L. uxpanapensis* es visitada por colibríes (*Brigada Vázquez 1582* (ENCB, MEXU)).

Paratipos. MÉXICO. **Oaxaca:** Dto. Pochutla, Mpio. de San Miguel del Puerto, Xadani al N Rancho San Agustín, 5.4 km NW del entronque del Puente San Lorenzo, 855 m, *S. Salas M. et al. 2839* (MEXU, OAX); Cafetal San Agustín, 882 m, *J. Pascual 1018* (MEXU, OAX); 800 m al N de la finca El Mamey, sobre la vereda a la poza del río del Faro, 550 m, *Alfredo Saynes V. et al. 2239* (ENCB, MEXU, OAX).

Clave para las Variedades de *Lophostachys guatemalensis* de México y Centroamérica

1. Flores generalmente mayores de 33 mm; segmentos exteriores del cáliz comúnmente mayores de 15 mm, glandular pubescentes; cápsulas de 13 mm de largo o más, conspicuamente pubescentes . . . . . *L. guatemalensis* var. *chontalensis*
1′. Flores hasta de 33 mm; segmentos exteriores del cáliz hasta de 15 mm, con escasos tricomas glandulares entremezclados; cápsulas hasta de 12 mm, puberulentas . . . . . *L. guatemalensis* var. *guatemalensis*

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Literatura Citada

Acosta, S. 1985. Algunas especies interesantes de la familia Acanthaceae en México. Phytologia 57: 249–260.

Daniel, T. F. 1993. A synopsis of *Lophostachys* (Acanthaceae) in Mexico and Central America. Selbyana 14: 64–70.

Nelson, C. 1993. A new species of *Lophostachys* (Acanthaceae) from Honduras. Phytologia 74: 438–439.

A New Species of *Brachystelma* (Apocynaceae) from South Tropical Africa

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Abstract. The new species *Brachystelma nutans* Bruyns (Apocynaceae, Asclepiadoideae) is described from the botanically relatively little-known Mount Namuli complex in the northern part of Zambézia Province of northern Moçambique.

Key words: Apocynaceae, *Brachystelma*, Moçambique.

Brachystelma Sims (Apocynaceae, Asclepiadoideae, Ceropegieae) consists of over 100 species that are widely distributed in sub-Saharan Africa. The main concentration of more than 70 species is found in southern Africa (Dyer, 1983; Bruyns, 1995), but there are a few species that occur as far afield as India and Australasia (Forster, 1996). The species are often poorly recorded, because the plants are difficult to locate in habitat and are geophytic, only appearing above the ground during the rainy season. The situation in Moçambique is illustrative of this. Information in the main herbaria indicated that the only species recorded from Moçambique was *B. simplex* Schlechter. However, my own exploration since 1998 has revealed that at least 10 species occur in Moçambique. Most of these are widely distributed in south tropical or East Africa (especially in Zimbabwe, Malawi, and Tanzania), but the present new species is known only from the two collections cited and seems to be endemic to the Mount Namuli complex. This series of granite peaks rises to over 2400 m and is the highest mountain range in the country.

Brachystelma nutans Bruyns, sp. nov. TYPE: Moçambique. Zambézia: Namuli, 1500–2000 m, 4 Jan. 2004, *P. V. Bruyns 9729* (holotype, BOL; isotype, MO). Figure 1.

Ab omnibus speciebus *Brachystelmatis* cognitis floribus grandioribus solitariis nutantibus, pedicellis longis et lobis corollae decrescentibus paulatim base ad apicem differt.

Small herb arising from flattened discoid tuber up to 10 cm diam.; *stems* prostrate to ascending, 5–20 cm, 1–2 mm thick, puberulous, reddish green. *Leaves* linear, 40–80 × 3–5 mm, green, puberulous along midrib underneath only, sessile. *Inflorescences* many, alongside almost every node except first 2 above tuber, each 1-flowered; pedicel 20–25 mm, brown, puberulous, ascending with decurved apex; sepals 5 mm, brown. *Corolla* nodding, outside green, puberulous, inside green toward base, red-brown toward apex of lobes, pubescent with fine white hairs, deeply lobed, with short cupular tube ca. 1 mm deep; *lobes* 13–16 × 3 mm at base, erect and incurved at tips, linear, acute. *Corona* 3.5 × 4 mm; outer lobes ca. 2.5 mm, bifid to well below middle into ascending flattened-obtuse lobules, yellow-green with white hairs on inside mainly in lower half; inner lobes ca. 1 mm, adpressed to backs of anthers and just exceeding them, narrowly deltoid, acute, yellow-green with green tips, with white hairs mainly near bases. *Fruit* and *seed* unknown.

Vegetatively *Brachystelma nutans* is not readily distinguishable from *B. lineare* A. Richard. However, florally it is unlike any other known species. The nodding flowers on fairly long but solitary pedicels are tinged with red-brown toward the tips of the lobes and never open up to become fully rotate. While the corolla lobes are comparatively long, they do not have the very broad base above which the lobes are almost filiform that one finds in *B. lineare* and *B. floribundum* Turrill. Furthermore, in both of these species the flowers are densely clustered in each inflorescence on short pedicels (solitary and on long pedicels in *B. nutans*) and are considerably larger than in *B. nutans*. In the new species the outer corona consists of fairly long, deeply bifid lobes. This is similar to the position in *B. floribundum*, but in *B. floribundum* the entire gynostegium is much larger and lies in the center of a broad, flattened base of the corolla. In *B. nutans* the corona is closely contained within the short but cup-like corolla tube. The outer corona of *B. nutans* is very different from that in *B. lineare*, where the lobes form shoulders behind the inner lobes and are deeply incised in the middle. The relatively long outer corona lobes of *B. nutans* are reminiscent of *B. circinatum* E. Meyer, and the two also share unusually short and broad pollinia (relative to the anther in which they are

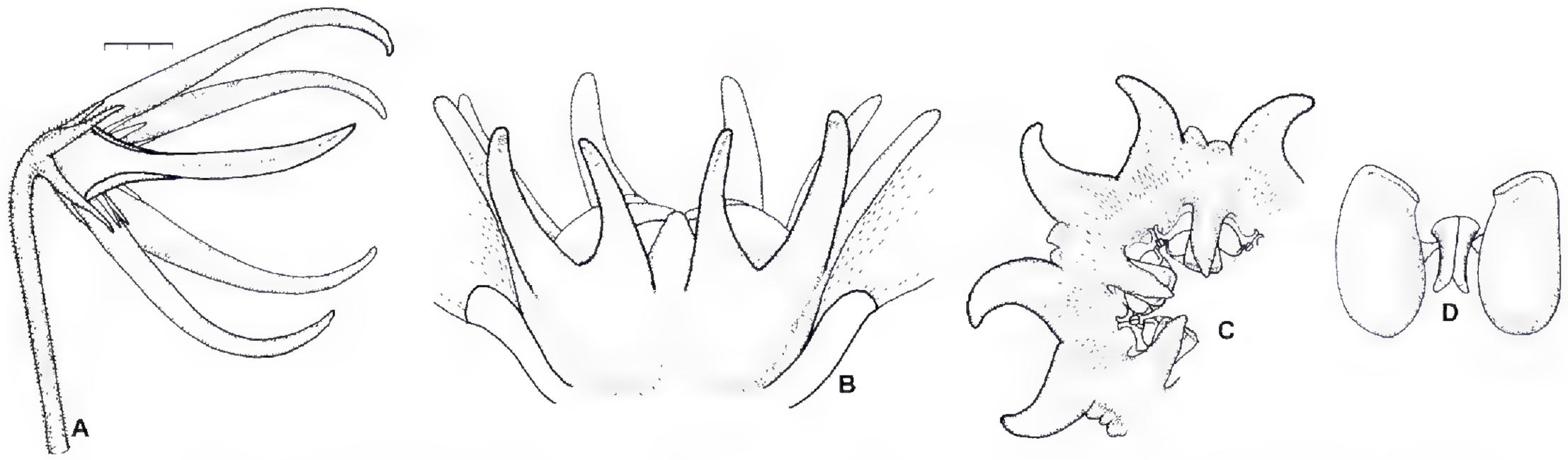

Figure 1. *Brachystelma nutans* (*Bruyns 9729*). —A. Side view of flower. —B. Side view of base of dissected flower and gynostegium. —C. Face view of part of gynostegium. —D. Pollinarium. Scale bar: A = 3 mm; B, C = 1 mm (at A); D = 0.25 mm (at A).

produced). However, *B. circinatum* differs in its very short, clustered pedicels, the very slender corolla lobes that remain joined at their tips, the hairs along the length of the outer corona lobes, and the much more erect habit of the plant.

Brachystelma nutans was found in shallow soils overlaying solid granite surfaces on Mount Namuli, where it was observed at two separate localities. In one of these it was the only species of *Brachystelma* present, but in the other it occurred together with *B. buchananii* N. E. Brown, which grew in slightly deeper ground between outcrops of granite.

Paratype. MOÇAMBIQUE. **Zambézia:** central Namuli, ca. 1400 m, *Bruyns 9741* (BOL).

Acknowledgments. I thank the curators of the Portuguese herbaria COI and LISC for the loan of material.

Literature Cited

Bruyns, P. V. 1995. New records and new species of Asclepiadaceae from Namibia. Bothalia 25: 155–172.

Dyer, R. A. 1983. *Ceropegia*, *Brachystelma* and *Riocreuxia* in Southern Africa. A. A. Balkema, Rotterdam.

Forster, P. I. 1996. *Brachystelma*. Flora of Australia 28: 280–282.

Three New Species of *Euphorbia* (Euphorbiaceae) from South Tropical Africa

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Abstract. Three new species, *Euphorbia namuliensis* Bruyns, *E. marrupana* Bruyns, and *E. stenocaulis* Bruyns (Euphorbiaceae), are described from the botanically poorly known northern parts of Moçambique.

Key words: *Euphorbia*, Euphorbiaceae, Moçambique.

Euphorbia L. is a cosmopolitan genus of ca. 2000 species, of which some 500 are succulent. The succulent species are mainly concentrated in Africa, Arabia, India, and Madagascar, with particularly high diversity in southern Africa and North East Africa. In the past these succulent species have been divided into a bewildering array of subgeneric groupings. Recent molecular research (Steinmann & Porter, 2002; Bruyns et al., 2006) has shown that many, if not most, of these groupings are artificial and not monophyletic. Consequently, it has been proposed that the succulent species be accommodated within four subgenera (Bruyns et al., 2006). Of these, subgenus *Euphorbia* includes (as section *Euphorbia*) all the succulents bearing paired spines on a hardened, horny spine shield surrounding the leaf. Section *Euphorbia* is confined to the Old World, where it is found in Africa and Arabia as well as on and around the Indian subcontinent. It is particularly diverse in tropical Africa.

The new species of *Euphorbia* described here all come from the northern parts of Moçambique. Moçambique is mostly a moist country during the summer months, with average annual rainfall varying between 600 and 2000 mm. Despite this generally high rainfall, the succulent, spiny, spine shield–bearing species making up *Euphorbia* sect. *Euphorbia* are fairly well represented in the country, and they are found in two main habitats. One is the relatively dry "forest" of the coastal plain. These forests have been much destroyed, but remnants are found from the south around Maputo at least as far north as Beira. The other habitat where they are frequently encountered is in shallow pockets of soil on granite domes. Granite domes are mainly found in the north of the country, especially north of the Zambezi River, and are often located in areas receiving an annual rainfall of well over 1000 mm. These domes vary from small hillocks projecting 20–200 m or more from the surrounding bush to the vast series of granite peaks known as Mount Namuli, which rise to over 2400 m and are the highest mountains in the country.

Among the species of *Euphorbia* sect. *Euphorbia* in south tropical Africa, there are two main growth forms: large shrubs to trees with thick stems and usually with a trunk-like central stem with a different shape to the side branches, and smaller shrubs with slender stems and without a differently shaped central stem. The following three new species belong to section *Euphorbia*, and all have the latter growth form.

Euphorbia namuliensis Bruyns, sp. nov. TYPE: Moçambique, Zambézia: Namuli, 800–1500 m, 4 Jan. 2004, *P. V. Bruyns 9723* (holotype, BOL; isotypes, K, MO). Figure 1A–E.

Ab omnibus aliis speciebus *Euphorbiae* in regione caulibus hexagonis rhizomatosis atrovirentibus et spinis stipulaceis spinas binatas longiores fere aequantibus differt.

Erect, shortly rhizomatous succulent to 40 cm tall with few unbranched stems; *stems* 6-angled, 12–20 mm thick, dark green; angles without teeth, spine groups 0.5–1 cm apart; spines below leaves gray to brown, paired, 5–8 mm, spreading; stipular spines 4–6 mm, ascending; spine shields often rudimentary, 1–4 × 1–2 mm, ± elliptical. *Leaf-rudiments* subulate, 2–3 × 2 mm. *Inflorescences* of solitary cymes, each with 3 cyathia (central male, 2 laterals developing later and female), on peduncle 1–2 mm, arranged in vertical series and maturing nearly simultaneously. *Cyathia* 3 mm, 3–4 mm diam., with reddish adpressed bracts ca. 1 mm, red, broadly funnel-shaped, smooth and glabrous; glands rectangular-elliptical, purplish green with black margins, 1 × 2 mm, contiguous; lobes ± semicircular, ca. 1 mm × ca. 1 mm, maroon, with deeply dentate margins; male flowers with spathulate deeply dentate bracteoles, ca. 2 mm, red, with pedicel 1.5–2 mm; female flowers with red ascending styles, 1 mm, joined at base and with very much thickened apices. *Capsules* glabrous,

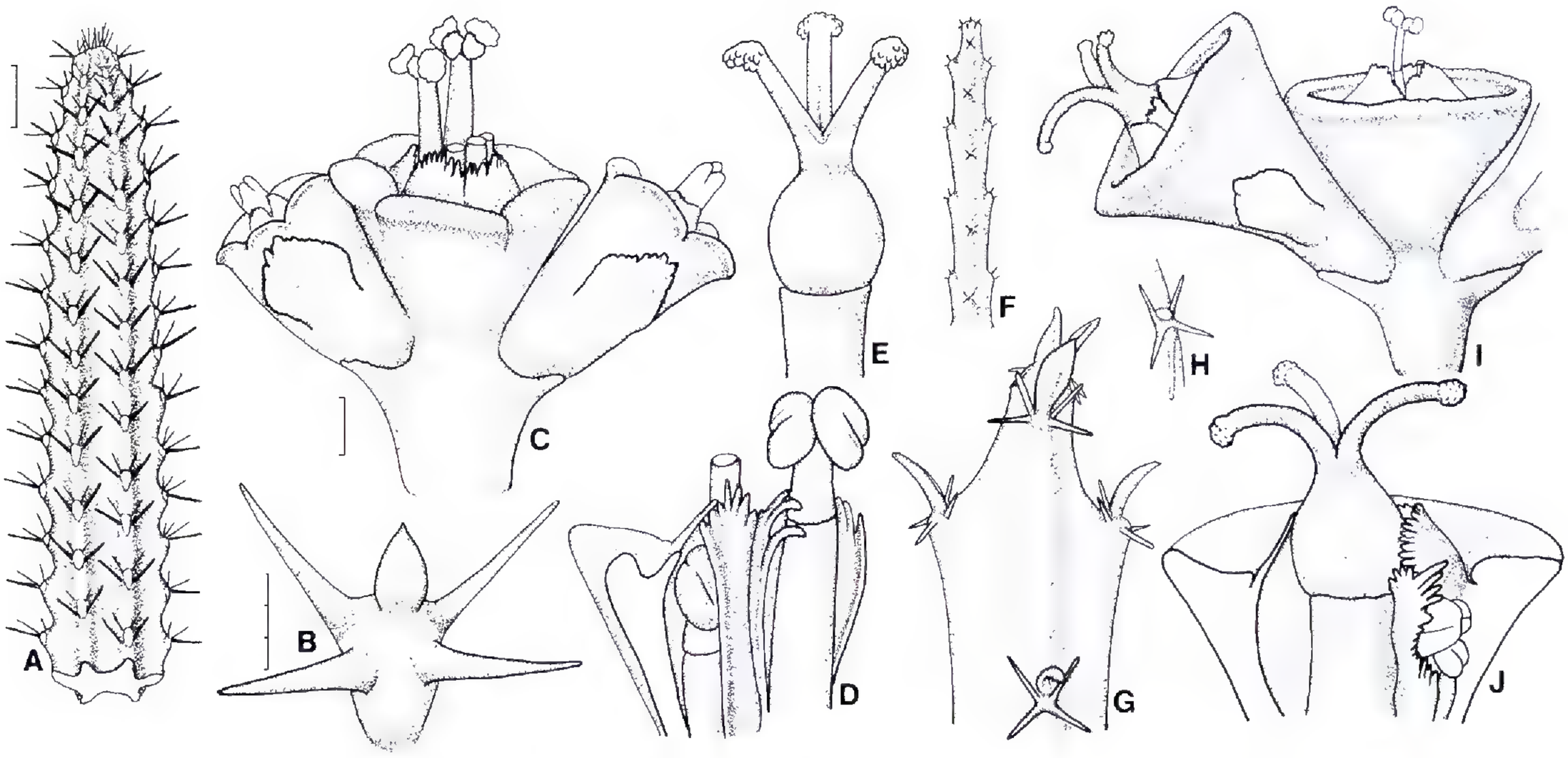

Figure 1. *Euphorbia namuliensis* (A–E, *Bruyns 9723*) and *Euphorbia stenocaulis* (F–J, *Bruyns 8534*). —A, F, G. Upper part of stem. —B, H. Spine complex, in B showing only spines, leaf-rudiment, and spine shield, in H showing spines and narrow spine shield descending below spines. —C, I. Cyme of three cyathia. —D, J. Dissected cyathium (male only in D, bisexual in J). —E. Female floret. Scale bars: A, F = 10 mm (at A); B, G, H = 3 mm (at B); C, I = 1 mm (at C); D, E, J = 1 mm (at B).

not exserted, 5 mm diam., red-green; seeds gray, covered with low rounded tubercles, nearly spherical, 2 mm.

This new species is common on the northern slopes of the Mount Namuli complex in Zambézia Province, Moçambique. *Euphorbia namuliensis* was found to have a wide altitudinal range, and plants were seen from the hotter outcrops near the base at about 800 m to some of the cooler, higher slopes. It grows among dense clumps of *Coleochloa* Gilly and various species of *Xerophyta* Jussieu on exposed, granite domes. Other succulents sharing the habitat were *Aloe chabaudii* Schönland, *A. mawii* Christian, *Kalanchoe elizae* A. Berger, *K. humilis* Britten, and *Sarcostemma viminale* (L.) R. Brown. Although very small forms of *E. mlanjeana* L. C. Leach were observed much higher up and farther southeast in the Namuli complex, no other species of *Euphorbia* was noted in the immediate vicinity. The rainfall in this area probably exceeds 1000 mm per annum, and deeper soils on the mountain support an open forest of *Brachystegia* Bentham, while orchids and other mesophytic monocots were quite common in less exposed spots.

With their rhizomatous habit, plants of *Euphorbia namuliensis* form very diffuse clumps. Within a clump, the stems are connected underground by horizontal runners up to 20 cm long or more, which are able to burrow through the extremely compacted, tough and dense, fibrous masses of the roots of *Coloechloa* and *Xerophyta*. The above-ground portions of the 6-angled stems are erect and unbranched and are dark green, with a gray spinescence. Their almost cylindrical shape is remarkably cactoid. They are covered with a very even spinescence, where the two stipular spines flanking the leaf-rudiment are only slightly shorter than the two spines below the leaf-rudiment. The spine shield on which all of them arise is inconspicuous and does not extend significantly downward to the next leaf-rudiment. The two stipular spines are mostly oriented upward against the stem, while the other two spines spread horizontally. The distinctively subulate and fleshy, upwardly curved leaf-rudiments are found on young growth in the upper 2–3 cm of the stems.

The stems of this new species are reminiscent of *Euphorbia baioensis* S. Carter from northern Kenya and *E. whellanii* L. C. Leach from northern Zambia. Of these two, the most similar in appearance is *E. whellanii*, which differs by the much thinner stems (to 8 mm diam.), very much smaller leaf-rudiments (to 0.5 mm long), shorter spines (to 3.5 mm long) that are also much less robust than those of *E. namuliensis*, and by the yellow cyathial glands (Leach, 1967). The relationships of *E. namuliensis* are more likely to lie among the various shrubby species found elsewhere in Moçambique. Within 100 km of where it occurs, *E. contorta* L. C. Leach, *E. decliviticola* L. C. Leach, and *E. mlanjeana* are found. The last two are much larger species with considerably thicker stems and a very much thicker, trunk-like central stem, and it is thus particularly to *E. contorta* that the new species must be compared. *Euphorbia contorta* is also a few-stemmed shrub without a morphologically distinct central trunk, and it occurs in a restricted area

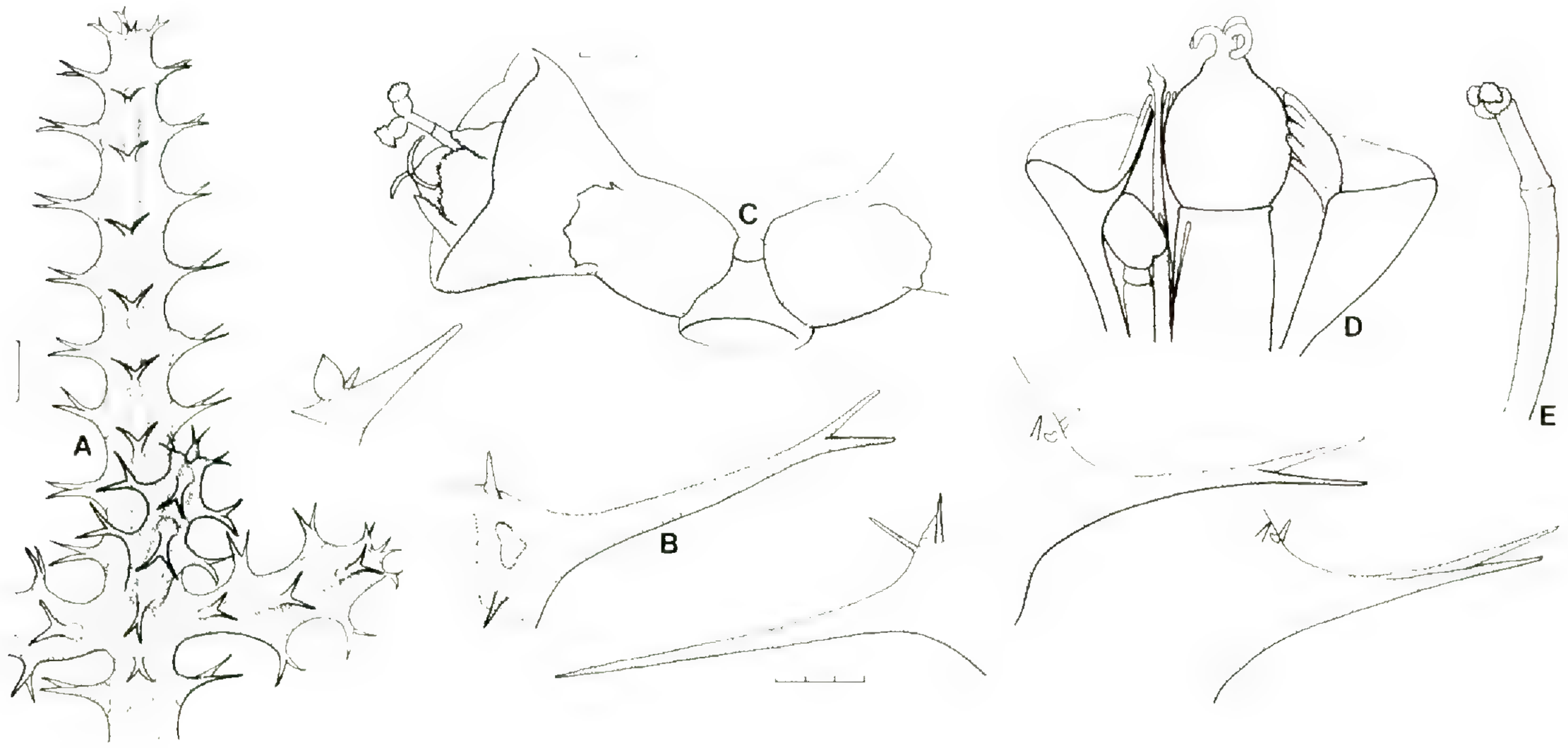

Figure 2. *Euphorbia marrupana* (*Bruyns 9707*). —A. Upper part of stem. —B. Spine complexes (young complex with leaf-rudiment shown in small sketch to right of A). —C. Cyme of three cyathia. —D. Dissected bisexual cyathium. —E. Male floret. Scale bars: A = 10 mm; B = 3 mm; C = 1 mm; D, E = 1 mm (at B).

between the towns of Lioma, Cuamba, and Malema, northwest of Mount Namuli in Zambézia and Nampula Provinces. In *E. contorta* the 4- to 7-angled stems are not at all rhizomatous. They are erect with horizontal branches, and the main stem spreads horizontally once it is sufficiently long (usually at about 0.3 m). In this way individual plants form diffuse shrubs. The stems are always distinctly grayish green and are armed with paired spines below the leaves, which are much larger than the two stipular prickles. The leaf-rudiments, usually at least 8 mm long, are comparatively large and broadly ovate in *E. contorta*. Here the cyathia (usually 5–6 mm diam.) are much broader than those of *E. namuliensis*, and they are held closer to the stems on very short peduncles.

Euphorbia marrupana Bruyns, sp. nov. TYPE: Moçambique. Niassa: E of Marrupa, 600 m, 2 Jan. 2004, *P. V. Bruyns 9708* (holotype, BOL). Figure 2.

Ab *Euphorbia unicorni* R. A. Dyer scutellis spiniferis brevioribus quam internodiis, aculeis stipularis juxta folios et glandibus cyathii divisis discedit.

Erect succulent to 1 m tall with many spreading stems, branching only above base, branches usually arising in groups along stems; *stems* 4- to 7-angled, 10–20 mm thick, dark gray-green often mottled with cream on young growth; angles toothed, spine groups 10–15 mm apart, spines below leaves black, solitary but often forked above base, 6–12 mm, spreading; stipular prickles up to 2 mm, ascending but inconspicuous; spine shields small, spreading downward to less than half distance to next leaf, 5–8 × 2–3 mm, linear-elliptic. *Leaf-rudiments* ovate, 1–2 × 1–2 mm. *Inflorescences* of solitary cymes, each with 3 cyathia (central male, 2 laterals bisexual, but on some plants male only) on peduncle up to 1 mm. *Cyathia* 2.5 mm, 3–4 mm diam., with pink bracts 1 mm, red to yellow, broadly funnel-shaped, smooth and glabrous; glands distinctly separate, yellow sometimes with red margins; lobes ± semicircular, 1.5 mm, red, with deeply dentate margins; male flowers with spathulate and deeply dentate bracteoles, 1–1.5 mm, red, with red pedicel to 3 mm; female flowers green, with spreading red styles up to 1 mm, on thick pedicel 1.5 mm. *Capsules* glabrous, remaining embedded within cyathial lobes, 4 mm diam., dark maroon along edges, rest cream; seeds gray with darker streaks, covered with rounded tubercles, very slightly longer than broad (ellipsoidal), ca. 1.8 mm.

The only species of *Euphorbia* found on the granite mountains where it occurs, this new species is fairly plentiful, but plants are usually quite scattered. As with all the "dome-dwellers," it grows in shallow soils in dense mats of *Coleochloa*. Plants are much damaged by the frequent fires that are lit on these mountains during the dry season, and this is probably the reason for their very scattered occurrence. Other succulents occurring with it are *Aloe mawii*, *Kalanchoe elizae*, and another species of *Kalanchoe* Adanson as well as *Sarcostemma viminale*. The rainfall in this area is high, probably exceeding 1500 mm per year.

Plants are usually extremely densely and irregularly branched, forming a fairly impenetrable shrub. The stems are peculiar for the variability from square, 4-angled stems to cylindrical stems with 6 or 7 angles and for the unusual variability in the spines. These are always single but are simple to deeply forked (Fig. 2B). In seedlings, the first spines that appear do so as four nearly equal spines around 1 mm long surrounding each leaf-rudiment. The stipular spines remain small, while the others are greatly modified later.

This species resembles *Euphorbia unicornis* in the often cylindrical stems with single spines and the tendency to produce branches in near whorls along the stems. However, *E. unicornis* branches more from lower down and tends to produce longer branches with fewer subdivisions, and consequently the plants are more rounded and symmetrical in appearance. In this new species the spine shields are not continuous down the stem, as they are in *E. unicornis*, but are much shorter than the internodes. In *E. unicornis* the stems are pale cream-green between the continuous and darker, usually brown spine shields. The leaf-rudiments are similar in size in both of them, but are stouter in *E. unicornis* and do not narrow toward the base. In *E. marrupana* the stipular prickles are adjacent to the leaf-rudiment, while in *E. unicornis* they are some distance away. The cyathia in *E. unicornis* are always deep maroon. The cyathial glands are closely contiguous and form a continuous narrow rim around the cyathium. In *E. marrupana* the glands are edged with red, are much broader, and are distinctly separate around the edge of the cyathium.

Paratypes. MOÇAMBIQUE. **Niassa:** E of Nungo, *Bruyns 9707* (E); just N of Maùa, *Bruyns 9714* (K).

Euphorbia stenocaulis Bruyns, sp. nov. TYPE: Moçambique. Zambézia: Mocuba, 250 m, 10 Nov. 2000, *P. V. Bruyns 8534* (holotype, BOL; isotypes, E, MO). Figure 1F–J.

Ab *Euphorbia plenispina* S. Carter cyathio flavo et glandibus cyathii annulum continuum circum cyathium facientibus nec distinctis distinguenda est.

Erect to somewhat creeping succulent to 30 cm tall with many stems, usually branching mainly at base; *stems* 4-angled, 4–7 mm thick, green suffused with red; angles without teeth, spine groups 10–15 mm apart; spines below leaves gray, paired, 2–3 mm, spreading downward; stipular spines 2–3 mm, ascending and forming an X-shape together with other 2 spines; spine shields very small, 3–4 mm, less than 1 mm broad, ± linear. *Leaf-rudiments* subulate, 2–3 × 1 mm. *Inflorescence* of solitary cymes each with 3 cyathia (central male, 2 laterals bisexual), on peduncle ca. 1.5 mm. *Cyathia* 3 × 4–5 mm, with green bracts, ca. 1.5 mm, with red midrib, yellow-green, broadly funnel-shaped, smooth and glabrous; glands yellow-green, ca. 2.5 mm × ca. 0.7 mm, fused into ± continuous cone; lobes semicircular, pale green, ca. 1 mm; male flowers with deeply dentate bracteoles, 1.5 mm, yellow, with pedicel ca. 2.5 mm; female flowers ca. 2.5 mm, green, with slender widely spreading styles, ca. 2 mm, with thickened apices, on stout pedicel ca. 1.5 mm. *Capsules* and seeds unknown.

This species is known on a small series of granite hills near Mocuba in the southern part of Zambézia Province. Here it occurs among dense clumps of *Coleochloa* in shallow mats of roots and soil on gently sloping, solid granite domes. Where it was found, it is extremely common and occurs together with *Huernia erectiloba* L. C. Leach & Lavranos, *Sarcostemma viminale*, and various species of *Xerophyta*.

In this slender-stemmed species, the stems creep and become somewhat rhizomatous. They are bright green with faint red markings and armed with very fine weak spines and with more or less equally long and similarly fine stipular prickles.

Euphorbia stenocaulis is similar to *E. plenispina*, which was described from a single, rather incomplete herbarium specimen. Both possess slender stems and have spines and prickles of equal length. The new species differs from *E. plenispina* in that the spines are somewhat shorter but, most particularly, in the yellow cyathia with the glands continuous around the top of the cyathium and not separate at all (red and separate in *E. plenispina*; Carter, 1999).

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Literature Cited

Bruyns, P. V., R. Mapaya & T. Hedderson. 2006. A new subgeneric classification for *Euphorbia* (Euphorbiaceae) based on molecular data. Taxon 55: 397–420.

Carter, S. 1999. New *Euphorbia* taxa in the Flora Zambesiaca area. Kew Bull. 54: 959–965.

Leach, L. C. 1967. *Euphorbia* species from the Flora Zambesiaca area VII. J. S. African Bot. 33: 247–262.

Steinmann, V. W. & J. M. Porter. 2002. Phylogenetic relationships in Euphorbieae (Euphorbiaceae) based on ITS and *ndh*F sequence data. Ann. Missouri Bot. Gard. 89: 453–490.

Agave vazquezgarciae (Agavaceae), a New Species from Jalisco, Mexico

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Abstract. *Agave vazquezgarciae* Cházaro & J. A. Lomelí, a new species from the Sierra de Manantlán Biosphere Reserve, Sierra de Cacoma, and Sierra de Cuale in southern Jalisco, Mexico, is described and illustrated. It belongs to subgenus *Littaea* (Tagliabue) Baker, group Amolae, and appears to be closely related to *A. peduncullifera* Trelease, which also occurs in western Mexico, including Jalisco. It differs from the latter in having a taller spike, much larger flowers, and firm, fibrous leaves that are narrower and have a larger, stouter terminal spine.

Resumen. Se describe e ilustra *Agave vazquezgarciae* Cházaro & J. A. Lomelí, especie nueva de la Reserva de la Biosfera Sierra de Manantlán, Sierra de Cacoma y la Sierra de Cuale en el sur de Jalisco, México. Pertenece al subgénero *Littaea* (Tagliabue) Baker, grupo Amolae y parece estar cercanamente relacionada a *A. peduncullifera* Trelease, la cual también habita en el oeste de México, incluyendo Jalisco. Difiere de ésta por una espiga más larga, flores mucho más grandes, hojas firmes, fibrosas y estrechas y espinas terminales más firmes y largas.

Key words: Agavaceae, *Agave*, century plant, Mexican endemic, protected natural areas, succulent plants, western Mexico.

Agave L. (Agavaceae) is an American genus of shrub-like multi-annual or perennial plants that produce leaves in basal rosettes and most of them bloom only once before dying (McVaugh, 1989). The genus was widely studied by Howard Scott Gentry, who published several books, one of them (1982) treating the taxa of North America. However, observations made in both cultivated and wild material from western Mexico revealed the existence of a new species not included in Gentry (1982).

In 1983, José A. Lomelí went on a field trip to Sierra de Manantlán, in southern Jalisco, Mexico, with his students from the Universidad Autónoma de Guadalajara. While teaching vegetation types, he found an *Agave* (the so-called century plant) growing on rocks west of Rincón de Manantlán, and he brought three plantlets back to the Jorge Victor Eller Botanical Garden. After 18 years of cultivation in Guadalajara City, in January 2002, two of these agaves started blooming; that month M. Cházaro and O. Valencia visited the botanical garden, noticed the unfamiliar and interesting specimens, and suspected they belonged to an undescribed species.

Seeking this species, Cházaro and Valencia later that month visited Sierra de Manantlán. As they walked from Rincón de Manantlán village uphill to El Almeal, several plants were first seen, with the aid of binoculars, growing on rocky cliffs at 1800 m, ca. five of them in bloom. Further scrutiny of this plant in the wild confirmed the initial suspicion that it was, indeed, an undescribed species. This was quite a surprise, because Sierra de Manantlán, together with the Chamela Bay region, both in Jalisco, are among the most botanically explored areas in western Mexico (Lott, 1985, 1993; Vázquez-García et al., 1995; A. Vázquez-García, pers. comm., 2000).

A second field trip was carried it out by M. Cházaro and J. A. Vázquez-García in February 2002, a few kilometers west of Rincón de Manantlán, in order to collect the holotype and isotypes.

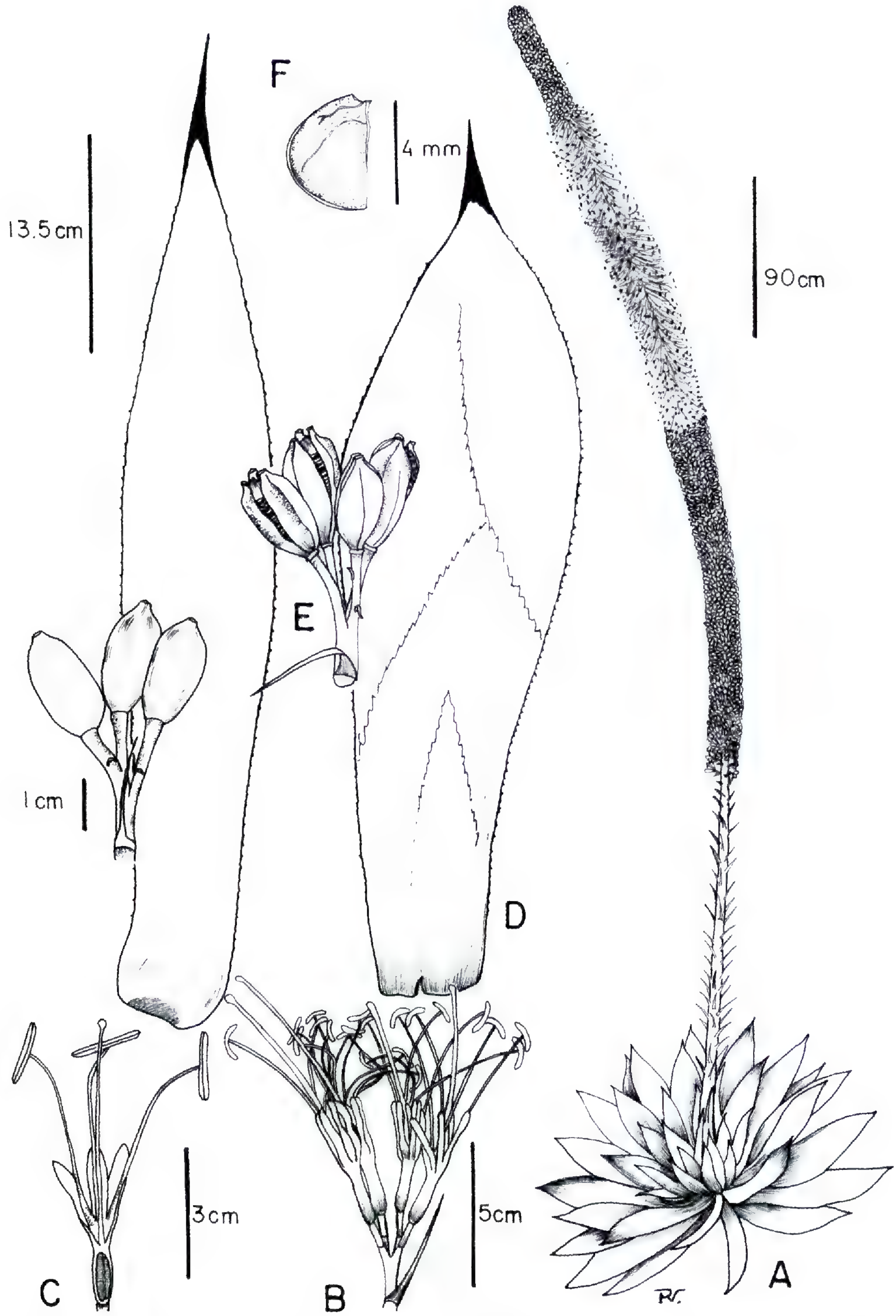

Figure 1. *Agave vazquezgarciae* Cházaro & J. A. Lomelí. —A. Flowering plant (drawing from a photograph). —B. Peduncle with four flowers. —C. Flower, longitudinal section. —D. Left, inner narrow leaf; right, basal wide leaf. —E. Peduncles with three immature (left) and four mature (right) capsules. —F. Seed, lateral view. All from *J. A. Lomelí-Sención & M. Rodríguez s.n.*, 12 Nov. 1983 (GUADA), except for A and D (left) from the holotype *Cházaro & A. Vázquez-García 8172* (IBUG).

Agave vazquezgarciae Cházaro & J. A. Lomelí, sp. nov. TYPE: Mexico. Jalisco: Mun. Cuautitlán de García Barragán, 2–3 km SW of Rincón de Manantlán, 100 m from Toma de Agua, 1550 m, 8 Feb. 2002, *M. Cházaro-Basáñez 8172 w/ A. Vázquez-García* (holotype, IBUG; isotypes, GUADA, MEXU, MO, WIS, XAL, ZEA). Figure 1.

Rosula acaulis, simplex, symmetrica, (0.6)1–1.2 m alta et (0.9)1.7–1.8 m diam. Folia 4–9 dm longa et 9.5–16.8 cm alta, lanceolata vel anguste elliptica, fibrosa et succulenta; margo dentatus, dentibus duo ab cm, quoque dente 0.5–3 mm longo et 3.5–4 mm lato in basi; spina apice subulata, 4–6.5 cm longa. Spica erecta, racemosa, 5–7 m alta; bracteae lineares, coriaceae, 4.4–10.5 cm longae et 2 mm latae ad infimum; bracteolae 2–4 mm longae, pedunculus 1–1.4 cm longus; pedicelli 0.5–1.4 cm longi, dichotomi. Flores binati, viridi-flavi, 5.2–9.4 cm longi toti; tubus infundibuliformis 6–10 mm longus et 3–6 mm diam.; tepala erecta vel ascendentia, 1.6–2.2 cm longa et 5–6 mm lata; filamenta staminalia 4–7.2 cm longa; antherae 1.6–2.3 cm longae et 1.3–2 mm latae; ovarium 1.3–2.7 cm longum et 5–7 mm diam.; stylus 4.9–7.7 cm longus aequalis vel longior quam stamina. Capsulae binatae praeter proximales simplices abortu, 1.8–2.4 cm longae et 1–1.3 cm diam., oblongae-obovoidae; pericarpium stramineum; semina 3–4 mm longa et 2–3 mm lata.

Acaulescent, single, symmetrical, open rosettes, (0.9)1.7–1.8 m diam., (0.6)1–1.2 m in height, not suckering. Leaves 70 to 80 on each plant, pale green to glaucous, lanceolate or narrowly elliptic, 40–91 × 9.5–16.8 cm, indurate, fibrous and succulent, base gradually narrowed, acuminate, with a sigmoid shape 8–9 cm below the apex, tapering at apex to subulate, reddish to dark brown or blackened stout spine 4–6.5 cm, blade margin usually closely dentate with 2 teeth per cm, each tooth brown, 0.5–3 × 3.5–4 mm wide at base. Spike erect, racemose 5–7 m high, 25–30 cm diam. including flowers, rachis 10 cm diam. at base; bracts linear, 1.4–10.5 × 0.2 cm wide at base, surrounding half of the peduncle, coriaceous; bracteoles 2–4 mm; peduncule 1–1.4 cm with helicoid arrangement; pedicel 0.5–1.4 cm, dichotomous. Flowers geminate, greenish yellow, 5.2–9.4 cm, including the stamens; tube funnelform, 6–10 × 3–6 mm diam.; tepals erect or ascending, 1.6–2.2 × 0.5–0.6 cm; staminal filaments 4–7.2 cm, attached at the apex of tube; anthers 1.6–2.3 cm × 1.3–2 mm, arched after dehiscence; ovary 1.3–2.7 × 0.5–0.7 cm diam., style 4.9–7.7 cm, equal to or longer than the stamens. Capsules geminate except those of the proximal part of the inflorescence that are single by abortion, oblong-obovoid, 1.8–2.4 × 1–1.3 cm diam.; pericarp thin, pale brown, slightly apiculate, the apicule triangular-prismatic; seeds 3–4 × 2–3 mm.

Common name and local uses. "Mezcal," "cola de zorra," or "lechuguilla." At Rincón de Manantlán it is reported (Rincón de Manantlán inhabitants, pers. comm., 2002) that fried flower buds are edible; they are called "bayusas."

Distribution. *Agave vazquezgarciae* is currently known only from the northern slopes of the Sierra de Manantlán Biosphere Reserve and a portion of the neighboring mountain chains Sierra de Cacoma and Sierra de Cuale, both in Jalisco, western Mexico, and included in the Sierra Madre del Sur physiographic province.

Habitat. Rupicolous on cliffs and slopes, from 1550 to 2100 m, pine-oak forest mixed with mesophytic elements. Associated species are *Chamaedorea pochutlensis* Liebmann, *Equisetum myriochaetum* Schlechtendal & Chamisso, *Oncidium graminifolium* (Lindley) Lindley, *Tillandsia* L., and *Woodwardia spinulosa* Martius & Galeotti.

Eponymy. The specific epithet honors José Antonio Vázquez-García, from the Botanical Institute, University of Guadalajara, a scholar of Magnoliaceae and the ecology of the cloud forest in Mexico, who has devoted 25 years to the study of the flora of western Mexico. In addition, he explored and collected intensively in Sierra de Manantlán for 12 years (1984–1996). For these reasons, we deemed appropriate to name this species after him.

Agave vazquezgarciae belongs to subgenus *Littaea* (Tagliabue) Baker, which is characterized by its spicate-racemose flowers in small, distinct clusters, and the group Amolae, which is distinguished by the densely flowered spike, tepals ascending to partly outcurving, and tube generally shallow and much shorter than the tepals (Gentry, 1982). The new species is closely related to *A. pedunculifera* Trelease, as expressed in its multi-annual, acaulescent habit and shallow tubes. Material of *A. vazquezgarciae* previously had been erroneously referred to or was included within *A. pedunculifera* by several authors (Gentry, 1982; McVaugh, 1989; Vázquez-García et al., 1995). However, *A. pedunculifera* does not occur in Sierra de Manantlán Biosphere Reserve, Sierra de Cacoma, or Sierra de Cuale (Sierra Madre del Sur physiographic province); it occurs in Chiquilistlán municipality, in Eje Neovolcánico Transversal physiographic province.

Agave vazquezgarciae presents morphological characters, geographical distribution, rupicolous habit, and a habitat preference that are distinctive enough to warrant its recognition as a discrete species. *Agave vazquezgarciae* is distinguished by its prominent and stouter spine and by firm, dark, never glaucous marginal teeth in both juvenile and mature individuals. *Agave pedunculifera* usually has an inconspicuous, curled terminal spine and the marginal teeth are usually glaucous in both juvenile and mature specimens; very rarely, some leaves may have dark but brittle teeth. Although McVaugh (1989) found that marginal teeth may be present or absent in the same *A. pedunculifera* population, we found no support for his observation. In both *A. pedunculifera* and *A. vazquezgarciae*, we found that marginal teeth are

Table 1. Morphological differences between *Agave vazquezgarciae* and *A. pedunculifera*.

Character	*Agave vazquezgarciae*	*Agave pedunculifera**
Leaves	lanceolate or narrowly elliptic, indurate and fibrous	ovate-acuminate or lanceolate, soft
Marginal teeth	brown and conspicuous; 2 per cm	glaucous and inconspicuous; 3 to 6 per cm
Terminal spine	4–6.5 cm, stout, reddish to dark brown	1–3 cm, weak, gray
Spike height, m	5–7	2–3
Bracts, form and texture	linear, coriaceous	usually triangular, soft
Bracts, length, cm	4.4–10.5	13–14
Bracts, width at base, mm	2	12
Total flower length, cm	5.2–9.4	3.9–4.4
Depth of tube, mm	6–10	≤ 6
Staminal filament length, cm	4–7.2	2.2–3.8
Style length	equal to or longer than stamens	shorter than stamens
Vegetation	pine-oak forest	tropical deciduous forest and pine-oak forest
Geographic distribution	Sierra de Manantlán, Sierra de Cacoma, and Sierra de Cuale	Chiquilistlán municipality, Eje Neovolcánico Transversal physiographic province

* Measures for *Agave pedunculifera* taken from *Gentry 23371* (MEXU), *Gentry 5692* (DES), *Gentry & Arguelles 18182* (MEXU), *Rose 1713* (US), and *A. Vázquez-García & Y. L. Vargas-Rodriguez w/ Reynaldo Baltazar 7955 g* (IBUG).

always present in mature specimens, and we only saw the absence of teeth along young leaves produced months before blooming and located close to the spike. In addition, *A. vazquezgarciae* differs from *A. pedunculifera* in having firm, fibrous, lanceolate or narrowly elliptic leaves versus soft, ovate-acuminate or lanceolate leaves. *Agave vazquezgarciae* has brown marginal teeth and a conspicuous, stout terminal spine 4–6.5 cm long versus glaucous marginal teeth and an inconspicuous, curled terminal spine 1–3 cm long in *A. pedunculifera*. Furthermore, *A. vazquezgarciae* has flower parts that are generally longer than in *A. pedunculifera* (Table 1).

We hypothesize that the incursion of ancestral *Agave pedunculifera*–like stock into a more humid environment favored the speciation process, from which *A. vazquezgarciae* arose.

Paratypes. MEXICO. **Jalisco:** Mun. Cuautitlán de García Barragán, Rincón de Manantlán–La Cumbre, *M. Cházaro-Basañez 8167 w/ O. Valencia-Pelayo* (IBUG); cerro de Las Yeguas, W Rincón de Manantlán, *R. Guzmán & A. Valenzuela 6547* (IBUG); Cerro Las Yeguas, *H. Iltis 2552* (IBUG, WIS, ZEA); Cerro El Almeal, *H. Iltis 2717* (IBUG, IEB, MEXU, WIS, ZEA); Rincón de Manantlán, rio después del Aserradero por el camino a Las Joyas, 12 Nov. 1983, *J. A. Lomelí-Sención & M. Rodríguez s.n.* (GUADA, IBUG, MEXU); SO de El Chante–Rincón de Manantlán, *H. Gentry 23507* (MICH); Mpio. Ayutla, Sierra de Cacoma, antes de Las Iglesias, rumbo a Ayutla, 14 Jan. 2006, *A. Vázquez-García 8601 w/ M. Cházaro-Basáñez, O. Valencia & Y. L. Vargas-Rodriguez* (IBUG, MO); Mpio. Talpa de Allende, Sierra de Cuale, predio Altamina, *A. Vázquez-García 7995 w/ T. Quintero, M. Mantilla, R. Murguía* (IBUG).

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Literature Cited

Gentry, H. S. 1982. Agaves of Continental North America. Univ. Arizona Press, Tucson.

Lott, E. J. 1985. Listados Florísticos de México. III. La Estación de Biología Chamela, Jalisco. Herbario Nacional, Instituto de Biología, Universidad Nacional Autónoma de México.

———. 1993. Annotated checklist of the vascular flora of the Chamela Bay region, Jalisco, Mexico. Occas. Pap. Calif. Acad. Sci. 148: 1–60.

McVaugh, R. 1989. 1–398 *in* W. R. Anderson (editor), Flora Novo-Galiciana, Bromeliaceae to Dioscoreaceae, Vol. 15. Univ. Michigan Herbarium, Ann Arbor.

Vázquez-García, J. A., R. Cuevas-G, T. S. Cochrane, H. H. Iltis, F. J. Santana-M. & L. Guzmán-H. 1995. Flora de Manantlán. Sida Bot. Misc. 13: 1–312.

Five New Species of *Guarea* (Meliaceae), Two from the *Guarea glabra* Vahl Complex, in Central America

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Abstract. Morphometric analysis of the *Guarea glabra* Vahl complex (Meliaceae) from Central America has distinguished 12 species, and two of these species are new to the complex: *G. arcuata* Coronado and *G. petenensis* Coronado. In addition, three species discovered to be superficially similar to the members of the *G. glabra* complex are found to be undescribed: *G. gentryi* Coronado, *G. mexicana* Coronado, and *G. zarceroensis* Coronado. The five new species are described below.

Key words: Central America, *Guarea*, *Guarea glabra* complex, Meliaceae.

Guarea L. is a distinctive Neotropical member of Meliaceae with continuously growing leaves. Pennington et al. (1981), the most recent monographers of the genus, recognized 35 species widely distributed in Central and South America. According to Pennington et al. (1981), *G. glabra* Vahl is one of the most variable of these species. Early workers, both flora writers (Blake, 1920) and monographers (Candolle, 1878), recognized several species in this complex, although these authors had very little material with which to work. Standley and Steyermark (1946) recognized six species in the *G. glabra* complex from Guatemala, while Smith (1965) listed two species from the complex in Panama. Pennington et al. (1981) recognized six poorly distinguishable races within the complex, and later Pennington and Styles (2001) took a similarly broad view in Nicaragua.

Guarea glabra is difficult to characterize because it is so variable, but it has a 4(5)-carpellate gynoecium with one ovule per loculus and a small (< 3.5 cm diam.) fruit. Its twigs and fruits usually lack lenticels, and there are quite often trichome tufts (domatia) on the lower surface of the leaflets. Coronado (2003) conducted a morphometric analysis of the *G. glabra* complex focusing on the Central America taxa. Variation was analyzed using principal components analysis (PCA) and unweighted pair group method with arithmetic mean (UPGMA) with a variety of combinations of characters and carried out at a variety of geographic scales. Twelve morphologically distinct entities (i.e., discrete clusters of specimens consistently appearing in country-level and lower-level analyses of variation) were evident, and these were recognized as species. The most important characters that differentiate species in the *G. glabra* complex are leaflet length, color upon desiccation, nature of the apex, number and course of secondary veins, petiolule length, pedicel width, petal length, staminal tube length and width, anther length and width, and ovary pubescence. Fruit characters are also useful, although relatively little material has ripe fruit (see Coronado, 2003). Two of the 12 recognized species, *G. arcuata* Coronado and *G. petenensis* Coronado, in the *G. glabra* complex are described below. Several collections from Central America previously identified as members of the *G. glabra* complex (Coronado, 2003) are recognized and described below as species of *Guarea*: *G. gentryi* Coronado, *G. mexicana* Coronado, and *G. zarceroensis* Coronado.

1. Guarea arcuata Coronado, sp. nov. TYPE: Costa Rica. Cartago, *Brown 17521* (holotype, F).

A speciebus aliis *Guareae*, praesertim *G. glabra* s.l., in foliolis in siccitate glabris brunneis haud discoloris venis lateralibus prominentibus arcuatis marginibus haud attingentibus, pedicellis ca. 3.5 mm longis, et floribus fructibusque glabris, differt.

Tree 5–30 m tall, 10–15 cm diam.; young branches glabrescent. *Leaves* with 2 to 4 pairs of leaflets, rachis semi-terete, finely pubescent; *petiolule* canaliculate, glabrescent, 5–13 × 2.5–3.5 mm; *blade* subcoriaceous, ovate, elliptic-oblong, 10–17.5 × 4–6.5 cm, apex short-acuminate, acumen 0.7–1.2 cm, base short-attenuate, both surfaces drying brown, adaxial surface glabrous, abaxial surface with hairs in vein axils, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins prominent, strongly arcuate, not reaching the margin, 6 to 9 pairs, 1.5–4 cm apart, tertiary veins raised. *Inflorescence* a raceme (branched), axillary or cauliflorous, 5–8 cm, glabrous; bracts 0.5–1 mm, sparsely pubescent; *pedicel* ca. 3.5 × 1 mm. *Flowers* white, glabrous,

apex of bud acute; calyx ± spreading, lobes 4 or 5; petals strap-shaped, apex acute; staminal tube glabrous, margin toothed; ovary surface irregular, glabrous, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx 1.5–2 mm, lobes ca. 0.5 mm; petals 7–8.5 × 1.5–2 mm; staminal tube 5–6 × ca. 3 mm; anthers ca. 1 × 0.3 mm; gynophore ca. 1.5 × 2 mm; nectary ca. 1 × 1 mm; ovary ca. 2 mm; style ca. 2.5 mm; stigma ca. 0.3 × 1 mm. *Carpellate flower*: calyx 2–2.5 mm, lobes ca. 1 mm; petals 6–6.5 × ca. 2.5 mm; staminal tube 5–6 × ca. 3.5 mm; anthers ca. 0.8 × 0.5 mm; gynophore 0–1 × ca. 1 mm; nectary 0–0.5 × ca. 1 mm; ovary ca. 3 mm; style ca. 2 mm; stigma ca. 0.3 × 1 mm. *Fruit* globose, red, ca. 2.5 cm diam., glabrous, surface smooth or with small lenticels; seeds 4; aril red.

Ecology, distribution, and phenology. In cloud, rain, and remnant oak forest, 1550–2450 m. Costa Rica (Cartago) and Panama (Chiriquí). Flowering and fruiting from January to October.

Guarea arcuata has very distinctive venation and flowers, the former in particular distinguishing it from other species of the *G. glabra* complex. The secondary veins are very prominent and arch broadly toward the leaflet margin, although they do not reach it, the fine venation is also raised, and the petiolule is 5–13 mm long; the flowers are glabrous.

Paratypes. COSTA RICA. **Cartago:** Turrialba, Tayutic, Fila Vereh, alto entre cuenca del Río Vereh y El Jicotea, *A. Cascante M. 604* (K); near Camp Empalme, Pan Amer. Hwy., *E. L. Little 6024* (F, MO). PANAMA. **Chiriquí:** Boquete, vic. Boquete, Finca Collins, *W. L. Stern, K. L. Chambers, J. D. Dwyer & J. E. Ebinger 1090* (F, MO); 6 mi. E of Cerro Punta on Boquete Trail, *E. L. Tyson 7213* (MO); vic. Bajo Mona & Quebrada Chiquero, *R. E. Woodson & R. W. Schery 587* (MO); Renacimiento, Jurutungo–Piedra Candela, *C. Galdames, J. Aranda, J. Guillén & B. Araúz 3480* (MO); Jurutungo, alrededores de la finca Los Quetzales, *C. Galdames 3381* (MO).

2. Guarea petenensis Coronado, sp. nov. TYPE: Guatemala. Petén: Río Pasión, Río Pucte tributary below Sayaxche, betw. Pucte & La Libertad, 5 Mar. 1964, *C. L. Lundell 18164* (holotype, MO).

A speciebus aliis *Guareae*, praesertim *G. glabra* s.l., in foliolis in siccitate viridis venis secondariis plus minusve planis et pilis in axillibus venorum instructis, calyce circa 1 mm longo (in floribus carpellatis) et ovariis pilis sparsis praeditis, differt.

Tree or treelet 5–20 m tall, 30 cm diam.; young branches strigillose or glabrescent, light brown or reddish brown. *Leaves* with 2 to 4(to 6) pairs of leaflets, rachis terete, strigillose; *petiolule* terete, strigose, 2–9 × 1–5 mm; *blade* subcoriaceous, elliptic-ovate to elliptic, 5.5–18.5(–22) × 2.6–6.3 (–8) cm, apex acuminate (acute), acumen 0.7–1.5(–2) cm, base short-attenuate, both surfaces drying pale green, adaxial surface glabrous, abaxial surface sparsely pubescent in vein axils and at margin, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins ± flat, slightly curved, not reaching the margin, 7 to 12 pairs, 1–3 cm apart, tertiaries raised, reticulate, not bullate. *Inflorescence* axillary or ramiflorous, a panicle, 2.5–4.5(–7.5) cm, sparsely strigillose, branches to 5 mm, 0 to 2 per inflorescence; bracts ca. 1 mm, densely pubescent; pedicel 0.5–2 × 0.3–1 mm, pubescent. *Flowers* cream or white, apex of bud rounded, sparsely pubescent mainly on the calyx and petal apices; calyx ± erect, teeth 4; petals strap-shaped, glabrous, apex acute; staminal tube sparsely pubescent outside, glabrous inside, margin toothed or entire; ovary surface smooth, pubescent, 4-locular, locules 1-ovulate. *Staminate flower*: calyx ca. 0.5 mm, teeth 0.2–0.4 mm; petals 5–6.5 × 2–2.5 mm; staminal tube ca. 5.5 × 2 mm; anthers ca. 1 × 0.3 mm; gynophore ca. 1 × 1 mm; nectary ca. 0.5 × 1.5 mm; ovary 1–1.5 mm; style ca. 3 mm; stigma 0.2–0.3 × 0.5–0.8 mm. *Carpellate flower*: calyx ca. 1 mm, teeth 0.2–0.4 mm; petals 3.5–4.5 × 1–2 mm; staminal tube ca. 3–5 × 3–3.5 mm; anthers ca. 1 × 0.5 mm; gynophore 0–0.5 × 0–1 mm; nectary absent; ovary 1–1.5 mm, sparsely pubescent; style ca. 2 mm; stigma 0.2–0.3 × 0.5–0.8 mm. *Fruit* globose, red, ca. 2 cm diam., surface rough, glabrous, sometimes sparsely pubescent, without a stipe; seeds 4; aril white.

Ecology, distribution, and phenology. Mature and very disturbed remnants of semideciduous forests, 150–1000 m. Mexico (Campeche, Chiapas, Jalisco, Nayarit, Oaxaca, Puebla, Quinta Roo, Tabasco, and Veracruz), Belize (Cayo, Orange Walk, and Toledo), Guatemala (Alta Verapaz, Izabal, and Petén), and Honduras (Atlántida and Olancho). Flowering and fruiting throughout the year.

Guarea petenensis is particularly common in Ocosingo, Mexico, and Alta Verapaz and Petén in Guatemala. It can be distinguished from the other species of the *G. glabra* complex by its sparsely pubescent leaflets that are elliptic-ovate to elliptic in shape, with trichome tufts in the vein axils, and by its short calyx ca. 1 mm (carpellate flowers) and sparsely pubescent ovary.

Paratypes. MEXICO. **Campeche:** Hopelchén, 4 km O del Ejido Santa Rosa, *P. Alvaro M. 615* (MEXU). **Chiapas:** Ocosingo, en las orillas del lado N de la Colonia Benito Juárez Miramar, sobre el camino a Laguna Miramar, *A. Reyes & M. Sousa S. 2192* (MO); Ocosingo, zona arqueológica de Yaxchilan, *Rincón 911* (MEXU); Ocosingo, 8 km al NW de

Boca Lacantúm camino a Palenque, *E. Martínez S. 11796* (MEXU, MO); Ocosingo, zona Marqués de Comillas, 3 km al SE de Ejido Benemerito de las Américas, camino a Flor de Cacao, *E. Martínez S. 7168* (MEXU, MO); Ocosingo, 3 km de Frontera Corozal sobre el Río Usumacinta, *E. Martínez S. 11450* (F, GH, MEXU, MO); Ocosingo, 9 km al NW de Crucero Corozal, camino San Javier–Lacanjá Chanzayab, *E. Martínez S. 6983* (MO); Ocosingo, Estación Chajul, sobre el Río Lacantún, *E. Martínez S., C. H. Ramos, G. Domínguez & R. Lombera 26463* (MEXU); Ocosingo, 500 m SE del poblado de Lacanjá Chanzayab, *López-García 117* (MEXU); Sabanilla, Finca Carmen, *A. Méndez T. 6345* (F, MEXU, MO). **Jalisco:** La Huerta, Rancho Cuixmala, Gargollo farm, E side of Cerro de la Alborada, *E. J. Lott, A. C. Sanders & P. A. Fryxell 4107* (MO). **Nayarit:** Islas Marías, María Madre, *Maltby 43* (NY). **Oaxaca:** 5 km al N de El Cantil, camino a Sola de Vega, *R. Cedillo T. & R. Torres C. 1802* (MO); Juchitán, 13 km al SW de Santa María Chimalapa, *R. Cedillo T. & R. Torres C. 1157* (MO); Matías Romero, 22 km al S de Esmeralda, 9 km al S del aserradero La Floresta, lomas al S de Río Verde, *T. Wendt, A. Villalobos C., I. Navarrete & J. Anguiano 3082* (MO); Pochutla, San Miguel del Puerto, Xadani, 1.5 km W hacia San Miguel, *J. Rivera H., S. Salas M. & M. Elorsa C. 2156* (MO); Santa María Chimalapa, cresta del cerro al N del Río del Corte, ca. 8 km NE de Santa María, *H. Hernández G. 959* (MO); Santa María Chimalapa, Río Verde, 7 km en linea recta al NE de Santa María Chimalapa, *P. Vera C., T. Wendt, H. Hernández G. & V. Gonzalez 155* (MO). **Puebla:** Rancho El Ajengibre, *T. D. Pennington & J. Sarukhan 9294* (CAS, NY). **Quintana Roo:** Km 77 de la carr. Ucum–La Unión, *E. Cabrera, J. L. Godinéz & H. de Cabrera 4540* (MO); 20 km al N de La Unión, *E. Cabrera & H. de Cabrera 2129* (MO); Othón P. Blanco, ruinas arqueológicas de Kohunlich, *R. Duran, R. Simá & C. Espadas 2746* (MEXU). **Tabasco:** Balancán, *E. Matuda 3085* (F, NY); Balancán, La Palma, *E. Matuda 3269* (F, NY); Rancho Dos Montes, Km 12, Carr. Villahermosa–Escarcega, atras del aeropuerto de Villahermosa, *Ascencio 100* (MEXU); Tenosique, ca. 15 km arriba de La Palma, por río a 5 km del Rancho Punta de Montaña, *R. Cowan & R. Niño 3370* (MO). **Veracruz:** Hidalgotitlán, Agustín Melgar, *Brigada Vazquez 505* (K, MO); Colonia Melchor Ocampo, Cantón de Córdoba, *C. Conzatti 171* (GH); Catemaco, *A. Villegas H. 1* (F, K); Cerro del Vigia, Catemaco, *J. I. Calzada 850* (F, K). BELIZE. **Cayo:** Hummingbird Hwy., 5.7 mi. S of Western Hwy., *D. E. Atha & J. Walker 1154* (MO, NY); betw. Millionario & Cuevas, *J. D. Dwyer 10822* (MO); 24.7 km al O de San Ignacio, sobre el camino a Belmopan, *E. Cabrera, P. Cowan & R. Durán 7749* (MEXU, MO); Chaa Creek, bank of Río Macal, *J. L. Brown & P. Cocon 38* (MO); Mtn. Pine Ridge Forest Res., Rio Frio Caves, 1 km W of Augustine, *J. Meare & A. Howe 1439* (MO); Mollejon Creek, on Morris Rd., 5 km S of Augustine, *J. Meare & A. Howe 1111* (MO); vic. Millionario, *A. Gentry 7703* (MO, NY); Cohune Ridge, *C. L. Lundell 6181* (F, NY); Benque Viejo, bordering Rio Mopan, *E. Contreras 7078* (MO, NY); Chiquibul Forest Res., San Pastor track, 1 km from Las Cuevas, *A. Ibáñez G. 69* (MO), *A. K. Monro 1431* (MO); El Pilar 13 km NW of San Ignacio, near Bullet Tree Village, *R. Arrigo 821* (GH, MO); Vaca Plateau, Blue Hole Camp, *D. A. Sutton et al. 18* (MO); 8 mi. S of Cohune Ridge, near Spanish water hole, *M. J. Balick et al. 2059* (K); Valentin, *C. L. Lundell 6351* (NY); Xunantunich, *D. Lentz et al. 2715* (NY). **Orange Walk:** Indian Church, *T. Arnason & J. Lambert 17033, 17090* (MO); Rio Bravo Conserv. & Managem. Area, *N. V. L. Brokaw 311* (MO). **Toledo:** vic. Sapote Camp, ca. 6.5 mi. due W of Medina Bank, *G. R. Proctor 35999* (MO); Sand Hill, Punta Gorda, *W. Schipp 1001* (F, MO, NY). GUATEMALA. **Alta Verapaz:** vic. caves, SW of Lanquín, *J. A. Steyermark 44124* (F, NY); Semococh, on Cobán Rd. from Sebol, *E. Contreras 4687* (GH); Telemán, Finca Mercedes, Panzós, faldas de la Sierra de las Minas, Quebrada Mercedes, *E. Martínez S., P. Tenorio, H. Droege & M. Díaz 22748* (MO). **Izabal:** 10–15 km W of El Estor, *W. E. Harmon & J. D. Dwyer 4307* (MO); Río Dulce, betw. Livingston & 6 mi. up river, *J. A. Steyermark 39385* (F). **Petén:** 35 km E de Sta. Elena, brecha El Remate–Tikal, *A. Molina R. 15410* (F, NY); vic. shoreline of Lake Yaxha, *B. D. Vanderveen 671* (MO); Río Pasión, on Ceibál ruins, *C. L. Lundell 17646* (GH); Carmelita, *F. E. Egler 42-318* (F); ca. 5 mi. S of Tikal Natl. Park, *J. D. Dwyer 11260* (NY, MO); Tikal Natl. Park, vic. Temple 1, *M. Schulze 5, 59* (MO); citio arqueológico, en el camino al campamento chiclero Mushanal, a 2 km, lado S de la Aldea Uaxactun, *R. Tún O. 2562* (F, MO, NY); Dos Lagunas, Ixcanrio, on Melchor de Menco Rd., 12 km SE, *E. Contreras 8614* (MO); El Cedro, *E. Contreras 8452* (MO); El Naranjo, *C. L. Lundell & E. Contreras 20573* (F, MO, NY); El Paso, *C. L. Lundell 1459* (F); Guayacán, ca. 6 km N on El Ceibo Rd., *E. Contreras 7350* (MO, NY); Guayacán, 2 km N of Laguna Guayacán, *E. Contreras 7391* (MO); La Cumbre, Las Cañas, E of Km 142, Petén–Izabál rd., *C. L. Lundell & E. Contreras 19064* (MO); La Cumbre, bordering Río Pusila, ca. 6 km from village, *E. Contreras 6948* (MO, NY); La Libertad & vic., *M. Aguilar H. 255* (F, MO); Lacandón, ca. 3 km SW on El Caribál trail, *E. Contreras 3405* (MO); Macanché, bordering lake, *C. L. Lundell & E. Contreras 19236* (MO); Puerto Chimono, Laguna Petexbatún, 20 km S of Sayaxché, *H. Zomer 288* (F); Santa Elena, on Sementario Santa Elena, *E. Contreras 5745* (MO); 5 mi. S of Tikal, *A. Gentry 8362* (MO, NY); Uaxactun, Bajo El Corchál, *C. L. Lundell & E. Contreras 19980* (MO); bordering Lake Petén Itzá, betw. San José & Chachaclún, *E. Contreras 10349* (MO, NY); Milpa Grande at Macanché, *E. Contreras 5456* (F); Chinchilá, Seból Rd., *E. Contreras 10687* (F); Westufer des Lago Petén Itzá, 1 km NNE-NE, Zentrum von San José, *B. Wallnöfer & F. M. Tut-Tesucun 5963* (MO). HONDURAS. **Atlántida:** Coyoles, *A. Molina R. & Becker 20* (F). **Comayagua:** Río Hondo, 5 km de La Libertad, *A. Molina R. & A. R. Molina 26818* (F); N of La Libertad, *D. Hazlett 1688* (MO); Valle de Jamalteca, *A. Molina R. 7184* (F); Villa de Taulabé, Quebrada de Caliche, *C. Nelson, E. Vargas, C. Alduvín & M. Pereira 3538* (MO). **Olancho:** Valle de Catacamas, Santa María del Real, *A. Molina R. 8423* (F, MO).

3. Guarea gentryi Coronado, sp. nov. TYPE: Costa Rica. Heredia, Finca La Selva, OTS Field Station on Río Puerto Viejo just E of jct. with Río Sarapiquí, ca. 100 m, 10 26′N, 84 1′W, 20 Mar. 1981, *J. Folsom 9404* (holotype, MO; isotype, F).

Guarea gentryi a speciebus aliis *Guareae* in laminis foliolorum oblongis vel ellipticis 11–19 × 4–7 cm in siccitate brunneis, inflorescentiis ramulis 8 usque ad 15 instructis, floribus numerosis parvis in alabastris apicibus late obtusis, in anthesis petalis subtriangularibus 3–4 × 2–3 mm et tubis staminalibus 2–3 × 3–4 mm, differt.

Tree 15–35 m tall, to ca. 1 m diam.; young branches sparsely pubescent to glabrescent. *Leaves* with 2 to 4 pairs of leaflets, rachis terete, minutely pubescent to glabrescent; *petiolule* terete, strigose,

bottle-shaped, 6–13 × 1–2 mm; *blade* subcoriaceous, oblong to elliptic, 11–19 × 4–7 cm, apex short-acuminate, acumen ca. 1 cm, base acute or cuneate, both surfaces drying brown, adaxial surface glabrous, abaxial surface with short trichomes sparsely scattered on the surface, with trichome tufts in the axils of secondary veins, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins strongly raised adaxially and slightly raised abaxially, slightly curved toward the margin, 6 to 9 pairs, 1.3–3 cm apart, tertiary veins slightly raised, reticulate. *Inflorescence* axillary, paniculate, 12–17 cm, sparsely pubescent, yellowish green, branches 3–7 cm, 8 to 15 per inflorescence, with numerous flowers; bracts ca. 1 mm, strigose; *pedicel* ca. 1 × 1 mm, with yellowish indumentum. *Flowers* greenish white, densely yellowish pubescent, apex of bud broadly obtuse; ovary glabrous, surface irregular, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx ca. 1 mm, ± spreading, teeth ca. 0.5 mm; petals 3–4 × 2–3 mm, subtriangular, flowers yellowish toward the apex, otherwise densely brownish pubescent; staminal tube 2–3 × 3–4 mm, scarcely pubescent to glabrescent outside, glabrous inside, margin dentate; anthers ca. 0.5 × 0.5 mm; gynophore absent; nectary ca. 0.3 × 1.5 mm; ovary ca. 1 mm; style ca. 1 mm; stigma 0.5 × ca. 1 mm, rounded. *Carpellate flower*: unknown. *Fruit* globose, brown, ca. 2 mm diam., surface minutely rough, not stipitate; seeds 3 or 4; aril red.

Ecology, distribution, and phenology. Collected in rain forest, 40–500 m, from Costa Rica (Heredia, Limón) and Nicaragua (Atlántico Norte). Flowering and fruiting in March.

Local collectors have included specimens of this species in the *Guarea glabra* complex because of the trichome tufts in the vein axils. However, *G. gentryi* is quite different, having staminate flowers with indumentum yellowish toward the apex, and otherwise densely brownish pubescent; a small, spreading calyx ca. 1 mm long; and short, subtriangular petals (3–4 × 2–3 mm). Its elliptic-oblong leaflets have bottle-shaped petiolules (the petiolule is rather swollen basally but narrows before it joins the lamina) and dry to a brown color on both sides.

The only collection known from Nicaragua was made in 1971 on the north Atlantic Coast in an area that is not protected; therefore, it is possible that this species is danger of extinction in that country.

Paratypes. COSTA RICA. **Heredia:** Finca La Selva, OTS Field Station on the Río Puerto Viejo just E of jct. with Río Sarapiquí, *B. Hammel & J. Trainer 12844* (F, MO, NY), *G. S. Hartshorn 1408* (MO, OXF). **Limón:** Res. For. Cordillera Volcánica Central, ca. 4.5 km N of entrance to Braulio Carillo along San José–Guápiles hwy., *B. Hammel, M. M. Chavarría, G. Herrera & R. Robles 17058* (MO); Matina, P.N. Barbilla, Cuenca del Matina, Col. Puriscalena, Sendero Cerro Azul, *E. Mora 906* (MO). NICARAGUA. **Atlántico Norte:** Sur de Río Wawa, 60 km NE de Puerto Cabezas, *E. L. Little 25202* (MO).

4. Guarea mexicana Coronado, sp. nov. TYPE: Mexico. Chiapas: Bochil, along rd. from Bochil to Simojovel, 4.5 mi. NE of Bochil, 31 May 1965, *D. E. Breedlove 10220* (holotype, NY).

Guarea mexicana a speciebus aliis *Guareae* in laminis foliolorum longe oblongis vel ellipticis 10–23.5 × 4–6 cm textura coriacea et petalis 9–11 mm (in floribus staminatis) vel 7.5–8 mm (in floribus carpellatis) longis, differt.

Tree 8–18 m tall; young branches sparsely pubescent. *Leaves* with 2 to 3(to 4) pairs of leaflets, rachis canaliculate, yellowish pubescent; *petiolule* inflated, yellowish pubescent, 4–6 × 2–3 mm; *blade* coriaceous, long-oblong to elliptic, 10–23.5 × 4–6 cm, apex short-acuminate, acumen 0.5–0.9 cm, base oblique, margin recurved, adaxial surface drying brown and abaxial surface drying light brown or pale green, adaxial surface glabrous, abaxial surface with indumentum on main veins, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins slightly raised adaxially, strongly raised abaxially, abruptly curved toward the margin, 8 to 11 pairs, 1–2.5 cm apart, tertiary veins raised, randomly reticulate. *Inflorescence* axillary, paniculate, 2–7 cm, sparsely to densely brown pubescent, branches 1–2 cm, 0 to 2 per inflorescence; bracts ca. 1 mm, pubescent; *pedicel* 2.5–3 × 1–2 mm, brown pubescent. *Flowers* white, apex of bud rounded; calyx densely pubescent to glabrescent, lobes ± erect; petals 5, valvate, oblong, apex rounded; staminal tube glabrous, margin entire, sparsely to densely yellowish pubescent; ovary glabrous, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx ca. 4 mm, lobes ca. 3 mm; petals 9–11 × 3–4 mm; staminal tube 7–8 × 5–6 mm; anthers ca. 0.5 × 0.6 mm; gynophore ca. 2 × 2 mm; nectary absent; ovary ca. 3 mm; style ca. 4 mm; stigma ca. 1 × 1 mm. *Carpellate flower*: calyx ca. 6 mm, lobes ca. 3.5 mm; petals 7.5–8 × ca. 3 mm; staminal tube ca. 5 × 4 mm; anthers ca. 1 × 1 mm; gynophore ca. 2 × 2 mm; nectary absent; ovary ca. 2 mm; style 1–2 mm; stigma ca. 0.7 × 0.5 mm. *Fruit* brown or dark red, ca. 3 cm diam., rough with few small lenticels, glabrous, calyx persistent; seeds 4; aril unknown.

Ecology, distribution, and phenology. Collected from lower montane rain forests, 900–1350 m, from Mexico (Chiapas) and Honduras (Comayagua). Flowering in May, August, and December; fruiting in August and December.

Guarea mexicana was included in *G. glabra* by Pennington et al. (1981). However, he saw only two specimens of this species and mentioned that they were intermediate between *G. excelsa* Kunth and *G. bijuga* C. DC. *Guarea mexicana* differs in a number of morphological features from any other members of the *G. glabra* complex and can be recognized by its long, relatively narrow, coriaceous leaflets (10–23.5 cm long, ca. 3 times longer than broad) in which the upper surface dries brown and the lower surface dries light brown or pale green, its oblique base, and recurved margins. Its flowers have a large calyx with erect lobes at least 3 mm long, while its fruits are brown and lenticellate.

Paratypes. MEXICO. **Chiapas:** Berriozábal, 13 km N of Berriozábal near Pozo Turipache & Finca El Suspiro, *D. E. Breedlove 20245* (F, MO), *D. E. Breedlove 35320* (MO), *D. E. Breedlove & A. R. Smith 21678* (MO), *D. E. Breedlove & R. D. Thorne 30774* (MO); La Chacona, *C. Enríquez 7581* (MEXU). HONDURAS. **Comayagua:** Trincheras, *L. O. Williams & I. Molina R. 14655* (MO).

5. Guarea zarceroensis Coronado, sp. nov. TYPE. Costa Rica. Alajuela, San Carlos, Zarcero, 870 m, 1 Mar. 1939, *A. Smith 1686* (holotype, NY; isotype, MO).

Guarea zarceroensis a speciebus aliis *Guareae* in laminis oblongis-ellipticis vel ovatis 9–20 × 4–8 cm apicibus abrupte acutis, petalis indumento flavido denso appresso praeditis, ovariis 4 usque ad 5-loculatis, et fructibus pericarpio duro pagina lamellata, differt.

Tree or shrub 3–20 m tall, 20–50 cm diam.; young branches glabrescent. *Leaves* with 3 to 4 pairs of leaflets, rachis canaliculate, minutely pubescent to glabrescent; *petiolule* canaliculate, strigose, 10–25 × 0.5–1.5 mm; *blade* membranaceous to subcoriaceous, oblong-elliptic to ovate, 9 20 × 4–8 cm, apex abruptly acute to rounded (acuminate to 2 cm), base cuneate, margin entire, drying pale greenish brown on abaxial surface and darker on adaxial surface, both surfaces glabrescent, venation eucamptodromous, midrib and secondary veins concolorous, secondary veins impressed adaxially, raised abaxially, slightly curved toward the margin, 5 to 8 pairs, 1–2.3 cm apart, tertiary veins raised, randomly reticulate. *Inflorescence* axillary, paniculate, 4 14 cm, pubescent, branches ca. 2 cm, 0 to 2 per inflorescence; bracts ca. 1 mm, pubescent; *pedicel* 1.5 3 × 1.5 2 mm, pubescent. *Flowers* white, sparsely pubescent, apex of bud rounded (acute); calyx lobed, ± erect; petals densely yellowish pubescent, oblong, apex acute; staminal tube glabrous, margin entire (undulate); ovary densely yellow-pubescent; style densely pubescent to glabrescent, 4- to 5-locular, locules 1-ovulate. *Staminate flower*: calyx 3–5.5 mm, lobes ca. 2.5 mm; petals 7–8 × 3 mm; staminal tube 5–6 × 3–5 mm; anthers 1.5–2 × ca. 1 mm; gynophore ca. 1 × 2 mm; nectary ca. 0.5 × 1.5 mm; ovary ca. 1.5 mm; style 2–3 mm; stigma ca. 0.5 × 1 mm. *Carpellate flower*: calyx ca. 2.5 mm, lobes ca. 1 mm; petals ca. 6 × 2.5 mm; staminal tube ca. 4 × 3 mm; anthers ca. 1.5 × 0.5 mm; gynophore ca. 0.5 × 1 mm; nectary absent; ovary ca. 2 mm; style ca. 1.5 mm; stigma ca. 0.5 × 1.5 mm. *Fruit* subspherical, ca. 2.5 × 2 cm, apparently 2-celled, surface ribbed, without lenticels; aril unknown.

Ecology, distribution, and phenology. Rain and cloud forests, 875–1150 m. Costa Rica (Alajuela). Flowering in March, September, and October; fruiting in July and September.

Material of this species has been tentatively identified as *Guarea brevianthera* C. DC., *G. trichilioides* L. [= *G. guidonia* (L.) Sleumer], *G. erythrocarpa* C. DC., *G. rhopalocarpa* Radlkofer, or the *G. glabra* complex (Pennington, 1981), but examination of all species of *Guarea* shows that it is quite distinct. Although *G. erythrocarpa* is similar to *G. zarceroensis* in leaflet shape and texture, the latter has a long petiolule 1–2.5 cm long, while *G. erythrocarpa* has a petiolule only ca. 0.5 cm long. *Guarea rophalocarpa* is the only other species from Central America with ridged or ribbed fruits, and these are much larger and more or less obovoid. *Guarea zarceroensis* is clearly different from South American species with ribbed fruits.

Paratypes. COSTA RICA. **Alajuela:** Alfaro Ruíz, 5 km SO Zarcero, *A. Smith 861* (F, MO), *A. Smith 2806* (F), *A. Smith 2899* (F), *A. M. Brenes 6718* (F); San Carlos, region Zarcero, *A. Smith 417* (F), *A. Smith 448* (MO); Upala, Dos Ríos, 5 km al S de Brasilia, Río Pizote, *G. Herrera 1053* (K, MO).

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Literature Cited

Blake, S. F. 1920. Meliaceae. Chinaberry family. *In* P. C. Standley (editor), Trees and Shrubs of Mexico. Bull. U.S. Natl. Mus. 23(3): 553–563.

Candolle, C. de. 1878. Meliacées. Monogr. Phan. 1: 399–758.

Coronado, I. M. 2003. Systematic Revision and Multivariate Analysis of the *Guarea glabra* Vahl (Meliaceae) complex from Mexico to Panama. M.Sc. Thesis, University of Missouri, St. Louis.

Pennington, T. D. & B. T. Styles. 2001. Meliaceae. Pp. 1419–1430 *in* W. D. Stevens, C. Ulloa Ulloa, A. Pool & O. M. Montiel (editors), Flora de Nicaragua, Tomo II. Monogr. Syst. Bot. Missouri Bot. Gard. 85.

———, ——— & D. A. H. Taylor. 1981. Meliaceae. *In* Flora Neotropica. Monograph 28. The New York Botanical Garden, Bronx, New York.

Smith, C. E, Jr. 1965. Flora of Panama. Part VI. Family 92. Meliaceae. Ann. Missouri Bot. Gard. 52: 55–79.

Standley, P. C. & J. A. Steyermark. 1946. Meliaceae. *In* Flora de Guatemala, Part V. Fieldiana Bot. 24: 444–468.

New Combinations in *Melaleuca* for Australian Species of *Callistemon* (Myrtaceae)

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Abstract. The Australian species of the bottlebrush genus *Callistemon* R. Brown are not sufficiently distinct from *Melaleuca* L. for *Callistemon* to be maintained as a separate genus. The primary character states used to justify maintenance of *Callistemon* are that its staminal filaments are free and not grouped. This breaks down as fused filaments in five groups, the defining features of *Melaleuca*, occur in some *Callistemon* species. Therefore, it is concluded that the two genera should be combined. The following new names are proposed for species being treated in a forthcoming account of *Melaleuca* for *Flora of Australia*: *M. faucicola* Craven, *M. flammea* Craven, *M. orophila* Craven, *M. paludicola* Craven, *M. salicina* Craven, *M. virens* Craven, and *M. williamsii* Craven. The following new combinations are established as transferred from *Callistemon*: *M. brachyandra* (Lindley) Craven, *M. chisholmii* (Cheel) Craven, *M. comboynensis* (Cheel) Craven, *M. flavovirens* (Cheel) Craven, *M. formosa* (S. T. Blake) Craven, *M. montana* (S. T. Blake) Craven, *M. pachyphylla* (Cheel) Craven, *M. pearsonii* (R. D. Spencer & Lumley) Craven, *M. phoenicea* (Lindley) Craven, *M. pityoides* (F. Mueller) Craven, *M. polandii* (F. M. Bailey) Craven, *M. recurva* (R. D. Spencer & Lumley) Craven, *M. shiressii* (Blakely) Craven, and *M. subulata* (Cheel) Craven. The following new combinations are also established from *Metrosideros*: *Melaleuca linearifolia* (Link) Craven, *M. linearis* var. *pinifolia* (Wendland) Craven, *M. pallida* (Bonpland) Craven, and *M. rugulosa* (Schlechtendal ex Link) Craven. Issues concerning a name in *Melaleuca* for the accepted species presently known as *Callistemon glaucus* (Bonpland) Sweet are mentioned.

Key words: Australia, *Callistemon*, *Melaleuca*, Myrtaceae.

Callistemon R. Brown is a well-known genus of Myrtaceae Adanson, cultivated widely in tropical to moderately temperate climates for its showy bottlebrush-shaped inflorescences. Within the family, *Callistemon* is closely related to *Melaleuca* L., from which it has been distinguished by contemporary authors (e.g., Johnson & Briggs, 1983; Byrnes, 1984; Barlow, 1986) on the basis of its stamens being dispersed around the hypanthium rim and the staminal filaments being free. *Melaleuca* has the stamens 5-grouped on the hypanthium, opposite the petals and fused for part, sometimes the greater part, of their length. *Callistemon* occurs indigenously in Australia and New Caledonia. The New Caledonian species assigned to *Callistemon* represent a different lineage to the species of that genus occurring in Australia and have also been transferred to *Melaleuca* (Craven & Dawson, 1998).

There was varying acceptance of *Callistemon* at generic level in the 19th century. In part this may have been because Brown (1814: 547) gave the genus an inauspicious beginning at the time of its first circumscription with the words: "The maximum of *Melaleuca* exists in the principal parallel, but it declines less towards the south than within the tropic, where its species are chiefly of that section which gradually passes into *Callistemon*, a genus formed of those species of *Metrosideros* [Banks ex Gaertner] that have inflorescence similar to that of *Melaleuca*, and distinct elongated filaments." Although Mueller (1864) treated species under the name *Callistemon*, he regarded the genus as being artificial. Bentham (1867: 118) treated *Melaleuca* and *Callistemon* as separate genera in *Flora Australiensis*, but he did comment that *Callistemon* "passes gradually into *Melaleuca*, with which F. Mueller proposes to reunite it." Baillon (1876) included *Callistemon* and two other genera (i.e., *Conothamnus* Lindley and *Lamarchea* Gaudichaud) in *Melaleuca*, recognizing them at sectional level; such a broad view of *Melaleuca* apparently has not been accepted by any subsequent worker.

It can be determined by virtue of their taxonomy, that a majority of taxonomists who studied *Callistemon* and *Melaleuca* in the 20th century accepted *Callistemon* as a valid genus (e.g., Cheel, 1924, 1925; Cheel & White, 1924; Blake, 1958, 1968; Briggs & Johnson, 1979; Carrick & Chorney, 1979; Johnson & Briggs, 1983; Byrnes, 1984; Barlow, 1986; Lumley &

Spencer, 1988, 1990; Molyneux, 1993; Spencer & Lumley, 1986a, b, 1991; Spencer, 1996). Briggs and Johnson (1979: 202) advocated taking the New Caledonian *Callistemon* species from that genus and treating them as either a separate genus or as part of *Melaleuca*. The morphological features supporting such an action were not given by Briggs and Johnson (1979), but from the context it seems that the *Melaleuca*-like leaves possessed by the New Caledonian callistemons were regarded by them as being taxonomically significant. Dawson (1978), as part of a study of the capsular-fruited Myrtaceae of the Pacific Ocean region, gave a combined generic description of *Melaleuca* and *Callistemon* on the grounds that they shared many features, although he (Dawson, 1992) treated them separately in a floristic treatment for New Caledonia. Craven and Dawson (1998) considered that the endemic New Caledonian species of the complex should be placed in the same genus and effected the transfer of the New Caledonian *Callistemon* species to *Melaleuca*. More recently, Craven and Lepschi (1999) noted that the circumscription of *Melaleuca* sensu Austral. auct. overlapped that of *Callistemon*.

Morphologically, there is very little evidence that can be advanced in support of the continued separate recognition of *Callistemon* and *Melaleuca*. The traditional feature of staminal filaments being free and dispersed in *Callistemon*, but fused and 5-grouped in *Melaleuca* breaks down, and fused, 5-grouped staminal filaments occur in some *Callistemon* species, as noted by several authors (Dawson, 1978; Johnson & Briggs, 1983; Byrnes, 1984; Craven & Dawson, 1998). The species in which this can be observed are the Australian *C. glaucus* (Bonpland) Sweet and *C. viminalis* (Solander ex Gaertner) G. Don, and the New Caledonian *C. buseanus* Guillaumin and *C. gnidioides* Guillaumin (the stamens in the latter sometimes being free). In *M. nervosa* (Lindley) Cheel the stamens are usually in the typical fused, 5-grouped condition, but rarely the filaments may be inserted directly on the hypanthium rim (i.e., no staminal ring or bundle claw is present), in which case they may be loosely 5-aggregated or dispersed around the hypanthium rim with no clustering evident. Orlovich et al. (1999) studied floral development in seven *Melaleuca* and four *Callistemon* species, with special attention being paid to the androecium. Although most of the species studied fell into two distinct groups based upon androecium development, corresponding to the typical melaleucoid and callistemonoid conditions, Orlovich et al. (1999) stated that there was a continuum between the two extremes and that there was no obvious point in this continuum for suggesting a division.

In the broader-leaved species of *Callistemon* the leaf venation is pinnate, whereas in *Melaleuca* the broader-leaved species of the *M. leucadendra* (L.) L. group have longitudinal venation (although it is pinnate in young seedlings of at least some species (Blake, 1968; Craven, unpublished data). Pinnate venation is not uncommon elsewhere in *Melaleuca* (e.g., *M. hypericifolia* Smith), and an intermediate longitudinal-pinnate condition can also occur (e.g., *M. elliptica* Labillardière and *M. groveana* Cheel & C. T. White). Another feature that may at first seem to separate the two genera is the presence of small processes or flaps on the distal, inner, fruiting hypanthial wall of many *Melaleuca* species. The flaps are in an antesepalous position (although the sepals per se usually have fallen) and may have a protective function against predation of the seed or may have a controlling function during seed shedding. These flaps are usually absent in *Callistemon*, but are present in *C. glaucus*, for example. In some cases, the flaps may be variably present within a species; in *M. fulgens* R. Brown flaps occur in some specimens but not in others.

Our knowledge and understanding of the interrelationships of the lineages within *Melaleuca* and its closer relatives will benefit from gene sequence research. The first such studies published are analyses of nrDNA sequence data from the 5 S and ITS-1 spacer regions (Ladiges et al., 1999; Brown et al., 2001) sourced from representatives of the *Beaufortia* suballiance sensu Briggs and Johnson (1979; modified in Johnson & Briggs, 1983). The *Beaufortia* suballiance is an informal taxon and is equivalent to the tribe Melaleuceae Burnett as defined by Wilson et al. (2005). Ladiges et al. (1999) sampled species of *Melaleuca* and *Callistemon* from Australia and New Caledonia for their study. Their analyses suggested that on the 5 S data the species studied fell into two major clades: the first clade containing some of the Australian melaleucas and all the Australian callistemons, and the second clade containing the New Caledonian melaleucas and callistemons, as well as most of the Australian melaleucas and all of the other sampled Melaleuceae genera. The jacknife values show that there is moderate to strong support for some of the higher level clades, but little support for the lower level clades. The ITS-1 data resulted in a topology with generally similar jacknife support, but with more major clades indicated; however, given the lack of lower level support, the tree may not be robust. Greater jacknife support is evident in the tree Ladiges et al. (1999) derived from analysis of a combined 5 S and ITS-1 data set, but even then lower level support is not strong. In suggesting that the endemic New Caledonian species of *Melaleuca* and *Callistemon* be

treated as a new genus, Ladiges et al. (1999) offered no morphological evidence supporting such an action, presumably coming to their conclusion solely on the basis of the 5 S and ITS-1 data.

The nrDNA research reported upon by Ladiges et al. (1999) was extended to include 72 ingroup (i.e., Melaleuceae) taxa by Brown et al. (2001), with a single outgroup taxon, *Lophostemon confertus* (R. Brown) P. G. Wilson & J. T. Waterhouse. The topology of the tree obtained from analysis of the combined data by Brown et al. (2001) is generally similar to that obtained by Ladiges et al. (1999) with two major clades evident. In one clade the New Caledonian species again form a clade sister to a group of Australian-centered *Melaleuca* species within a clade that contains some other *Melaleuca* species and all the sampled genera other than *Melaleuca* and *Callistemon*, i.e., *Beaufortia* R. Brown, *Calothamnus* Labillardière, *Conothamnus*, *Eremaea* Lindley, *Lamarchea*, *Phymatocarpus* F. Mueller, and *Regelia* Schauer. In the other clade, the Australian *Callistemon* species form a clade sister to a group of Australian *Melaleuca* species. The position of one species, *M. foliolosa* Bentham, was unresolved. Ladiges et al. (1999) and Brown et al. (2001) did not find evidence that paralogy was occurring, although this was not investigated per se in either study.

The significance of hybridization for molecular sequence studies in *Melaleuca* needs to be taken into account. There is some evidence in the literature that, where hybridization has occurred, inferred phylogenies derived from sequence data may be incongruent with the known relationships of the parental taxa. Fuertes Aguilar et al. (1999) in a study of *Armeria* Willdenow (Plumbaginaceae) found that cladistic analyses of ITS sequence data were incongruent with morphological relationships and concluded that introgression was responsible for the observed molecular pattern. The majority of *Armeria* species are diploid, and Fuertes Aguilar et al. (1999) believed that concerted evolution was acting to homogenize ITS in the introgressant populations. Hybridization and other issues relevant to the use of ITS for phylogenetic reconstruction in plants have been discussed by Álvarez and Wendel (2003), who concluded that the complex and unpredictable evolutionary behavior of ITS reduced its suitability for phylogenetic analysis.

The available evidence indicates that polyploidy, a good indicator of hybridization, may be a relatively infrequent phenomenon in *Melaleuca* and *Callistemon*. Perusal of the recorded chromosome counts for the two genera indicates that the great majority of species are diploid with $2n = 22$ (Rye, 1979; W3Tropicos, 2006) and with a few recorded instances of $2n = 24, 33, 44, 66$ (James, 1958; W3Tropicos, 2006). Rye (1979) recorded 71 counts being $2n = 22$, three of $2n = 24$, four of $2n = 33$, four of $2n = 44$, and one of $2n = 66$. Hybridization in nature has been noted in *Melaleuca* and *Callistemon* in the following instances: in the *M. leucadendra* species group (Blake, 1968; Cumming, pers. comm.); between *M. bracteata* F. Mueller and *M. styphelioides* Smith (Lepschi, pers. comm.); between diverse species of the *M. scabra* R. Brown group, i.e., *M. leuropoma* Craven and *M. systena* Craven (Craven, pers. obs.); between several species of the *M. uncinata* R. Brown complex (Broadhurst et al., in prep.); between *M. aspalathoides* Schauer and *M. holosericea* Schauer (Lepschi, pers. comm.); between *M. barlowii* Craven and *M. nematophylla* F. Mueller ex Craven (Craven, pers. obs.); between diverse species of the *M. laxiflora* Turczaninow group (Craven, pers. obs.); between *C. citrinus* (Curtis) Skeels and *C. subulatus* Cheel (Craven, pers. obs.); and is suggested between *M. alternifolia* (Maiden & Betche) Cheel and *M. linariifolia* Smith (Butcher et al., 1994, 1995). Many of the foregoing instances of hybridization are documented by herbarium specimens deposited in CANB. In several of the above instances (i.e., hybrids between *M. leuropoma* and *M. systena*, *M. barlowii* and *M. nematophylla*, and *C. citrinus* and *C. subulatus*), hybrid swarms were present indicating that the hybrids were fertile; whether or not backcrossing to either or both parents was also occurring was not known. Herbarium specimens identified as putative hybrids, or as being intermediate, between the following other species pairs are deposited in CANB: *M. araucarioides* Barlow and *M. bracteosa* Turczaninow, *M. arcana* S. T. Blake and *M. quinquenervia* (Cavanilles) S. T. Blake, *M. bracteosa* and *M. pomphostoma* Barlow, *M. coronicarpa* D. A. Herbert and *M. lateriflora* Bentham, *M. decussata* R. Brown and *M. gibbosa* Labillardière, *M. lasiandra* F. Mueller and *M. nervosa*, *M. monantha* (Barlow) Craven and *M. tamariscina* Hooker, and *M. rhaphiophylla* Schauer and *M. viminea* Lindley. Given that hybridization in *Melaleuca* is relatively widespread at the present time, it is not unreasonable to expect that it has been occurring over a long period. If hybrids are at least partly fertile and the existence of hybrid swarms are evidence of this, it may be expected that hybridization may have been accompanied by lineage sorting and/or concerted evolution leading to the introgression of foreign DNA into a particular species' lineage. Future molecular sequence studies should be designed to test for such introgression.

Based upon my observations of the morphology of all species of *Melaleuca* and *Callistemon*, together with representative species of the other genera of the Melaleuceae Burnett, i.e., *Beaufortia*, *Calothamnus*,

Conothamnus, *Eremaea*, *Lamarchea*, *Petraeomyrtus* Craven, *Phymatocarpus*, and *Regelia*, it is my conclusion that the species of *Melaleuca* and *Callistemon* should be placed within the same genus. In the following section the accepted taxa of *Callistemon* for which names are not yet available in *Melaleuca* are transferred to that genus.

In the case of the Western Australian species *Callistemon glaucus*, there is a prior applicable name in *Melaleuca*, *M. paludosa* R. Brown, that is not being taken up for the species. The name *M. paludosa* (Brown, 1812) is a taxonomic synonym of, and has nomenclatural priority for, this plant (Lumley & Spencer, 1988). Lumley and Spencer (1988), however, rejected the use of the epithet *paludosa* for the western species in *Callistemon* on the basis that the epithet had been persistently applied to an eastern Australian species, *C. paludosus* F. Mueller, published in 1858 (Mueller, 1858). The Mueller name is based on a misapplication by Schlechtendal (Lumley & Spencer, 1988) to the eastern species. Although there is no nomenclatural impediment to using *M. paludosa* for the western species, the name has never been used for the species since its description and it would create further, unnecessary confusion to do so now. Given that rejection of a name is possible under the *International Code of Botanical Nomenclature* (Greuter et al., 2000), a case is being prepared for the rejection of *M. paludosa* against *Metrosideros glauca* Bonpland and all other names based upon it.

1. **Melaleuca brachyandra** (Lindley) Craven, comb. nov. Basionym: *Callistemon brachyandrum* Lindley, J. Hort. Soc. London 4: 112. 1849. TYPE: England. Cultivated [Provenance: Australia, 1843, *comm. G. Grey*], *leg. ign. s.n.* (holotype, CGE not seen; isotype, CGE photo).
2. **Melaleuca chisholmii** (Cheel) Craven, comb. nov. Basionym: *Callistemon chisholmi* Cheel, Proc. Linn. Soc. New South Wales 50: 260. 1925. TYPE: Australia. Queensland: Thompson River Fall, 26 Aug. 1921, *J. R. Chisholm s.n.* (holotype, NSW; isotypes, BRI not seen, CANB).
3. **Melaleuca comboynensis** (Cheel) Craven, comb. nov. Basionym: *Callistemon comboynensis* Cheel, Proc. Linn. Soc. New South Wales 68: 184. 1943. TYPE: Australia. New South Wales: Upper Lansdowne, in crevices of rocks, 6 May 1925, *E. Cheel s.n.* (lectotype, designated here, NSW).

There are two other authentic collections in NSW, one of them a wild-collected collection (Comboyne, *E. C. Chisholm 280*) and the other a specimen from a plant cultivated from seed of the lectotype collection (Cultivated, Ashfield, Sydney, 25 Jan. 1943, *E. Cheel s.n.*). The date and locality attributed to the Cheel collection cited as type in the protologue, i.e., December 1926, is different from that given on the lectotype, but it appears that Cheel may not have been overly concerned with accuracy in the documentation aspects of taxonomic research. In any event, it has been thought desirable to lectotypify the name rather than to accept as a holotype the (apparently only) wild-collected collection that Cheel made.

4. **Melaleuca faucicola** Craven, nom. nov. Replaced name: *Callistemon pauciflorus* R. D. Spencer & Lumley, Muelleria 6: 295, f. 2. 1986. TYPE: Australia. Northern Terr.: Serpentine Gorge, Heavitree Range, 5 Aug. 1985, *H. I. Aston 2564* (holotype, MEL; isotypes, CANB, DNA not seen, MEL, PERTH not seen).

A new specific epithet is required as *pauciflora* is preempted in *Melaleuca* by *M. pauciflora* Turczaninow. The new epithet is derived from the Latin "faux," throat, hence gorge, and "-cola," inhabitant or dweller, in reference to the habitat in which this species occurs.

5. **Melaleuca flammea** Craven, nom. nov. Replaced name: *Callistemon acuminatus* Cheel, in J. H. Maiden, Ill. N.S.W. Pl. 63, t. 23. 1911. TYPE: Australia. New South Wales: on rocky mountain slopes, Crawford River, 11 km from Bulahdelah, 19 Oct. 1902, *E. Cheel s.n.* (lectotype, designated here, NSW).

The specimen designated lectotype above is of good quality and possesses buds, flowers, and young fruit, whereas Cheel's other syntype (Alum Mountain, Bulahdelah, Oct. 1907, *J. H. Maiden s.n.*, NSW) is in early flower. A second sheet from Crawford River (without collector or date) is not considered to represent syntype material.

Use of the epithet *acuminata* in *Melaleuca* is preempted by *M. acuminata* F. Mueller, and a new name is required. The epithet *flammea* is derived from the Latin "flammeus," fiery or fiery-red, in reference to the staminal filament color in this species.

6. **Melaleuca flavovirens** (Cheel) Craven, comb. nov. Basionym: *Callistemon rugulosus* var. *flavovirens* Cheel, in J. H. Maiden, Ill. N.S.W. Pl. 3: iv [in key]. 1911. *Callistemon flavo-virens* (Cheel) Cheel, Proc. Linn. Soc. New South Wales 50: 263. 1925. TYPE: Australia. New South Wales: Boonoo Boonoo, in creek bed into waterfall, Nov. 1904, *Boorman s.n.* (lectotype, designated here, NSW; isotype, BRI).

There is other syntype material in NSW (Queensland, Stanthorpe, Nov. 1904, *Boorman s.n.*), but this represents *Melaleuca pallida* (Bonpland) Craven. The material designated above as lectotype of *Callistemon rugulosus* var. *flavorirens* conforms with the protologue, and its choice as such maintains the usual application of the epithet.

7. **Melaleuca formosa** (S. T. Blake) Craven, comb. nov. Basionym: *Callistemon formosus* S. T. Blake, Proc. Roy. Soc. Queensland 69: 83, fig. 1C. 1958. TYPE: Australia. Queensland: near Kingaroy (near Edenvale Railway Station), low plateau, remnant of mixed low forest on red loam, Sep. 1954, *S. T. Blake 19704* (holotype, BRI; isotypes, AAU, CANB, MEL).
8. **Melaleuca linearifolia** (Link) Craven, comb. nov. Basionym: *Metrosideros linearifolia* Link, Enum. Pl. Hort. Reg. Berol. 2: 26. 1822. *Callistemon linearifolium* (Link) DC., Prodr. 3: 223. 1828. TYPE: Germany [Apparently cultivated in Berlin of Australian provenance] (holotype, G-DC not seen).
9. **Melaleuca linearis** Schrader & Wendland var. **pinifolia** (Wendland) Craven, comb. et stat. nov. Basionym: *Metrosideros pinifolia* Wendland, Coll. Pl. 1: 53, t. 16. 1807. *Callistemon pinifolium* (Wendland) Sweet, Hort. Brit. (Sweet). 155. 1826. TYPE: Germany. Cultivated at Hannover (type, Wendland, Coll. Pl. 1: 53, t. 16. 1807, the figure and description).

A specimen has not been located, and the name is here typified by the plate and description.

10. **Melaleuca montana** (S. T. Blake) Craven, comb. nov. Basionym: *Callistemon montanus* S. T. Blake, Proc. Roy. Soc. Queensland 69: 84, fig. 1D. 1958. TYPE: Australia. Queensland: Springbrook, 900 m, 12 Jan. 1931, *W. Rudder s.n.* (holotype, BRI; isotypes, CANB, NSW).
11. **Melaleuca orophila** Craven, nom. nov. Replaced name: *Callistemon teretifolius* F. Mueller, Linnaea 25: 387. 1853. TYPE: Australia. South Australia: Lake Torrens district, Elders Range, *F. Mueller s.n.* (lectotype, designated here, MEL ex hb. Steetz; isotype, MEL).

Mueller also described this species in the text of an account of his exploration (Mueller, 1853). It seems that both descriptions were published in April 1853, but that which appeared in *Linnaea* is accepted here as the protologue as it contains the technical description of the taxon. There are two sheets of apparently the same Mueller collection in MEL that are available for typification purposes, one each from the Mueller and Steetz herbaria. The sheet from the Steetz herbarium is more ample and is here designated lectotype.

The new epithet is required as *teretifolia* is preempted in *Melaleuca* by *M. teretifolia* Endlicher; the epithet is derived from the Greek "oros," mountain, and "philos," loving, hence mountain-loving.

12. **Melaleuca pachyphylla** (Cheel) Craven, comb. nov. Basionym: *Callistemon pachyphyllus* Cheel, in J. H. Maiden, Ill. N.S.W. Pl. 61, t. 22. 1911. TYPE: Australia. New South Wales: Bulahdelah, Oct. 1902, *E. Cheel s.n.* (lectotype, designated here, NSW).

Only three of the syntypes of *Callistemon pachyphyllus* have been seen: that designated lectotype above, a collection by Cheel (about 2.4 km from Bulahdelah, 18 Oct. 1902, NSW), and a collection by Baeuerlen (Wardell, Jan. 1892, No. 728, NSW). The lectotype is the specimen used for the illustration forming part of the protologue, has adequate flowers, fruit, and foliage, and conforms well with Cheel's concept of the species; for these reasons it is considered that lectotypification is feasible without all syntypes having been seen.

13. **Melaleuca pallida** (Bonpland) Craven, comb. nov. Basionym: *Metrosideros pallida* Bonpland, Descr. Pl. Malmaison 101, t. 41. 1816. *Callistemon pallidum* (Bonpl.) DC. Prodr. 3: 223. 1828. TYPE: France. Cultivated at the Jardin de la Malmaison, May 1815, *A. J. A. Bonpland s.n.* (holotype, P).
14. **Melaleuca paludicola** Craven, nom. nov. Replaced synonym: *Callistemon sieberi* DC., Prodr. (DC.) 3: 223. 1828. *Callistemon salignus* var. *sieberi* (DC.) F. Mueller, Fragm. 4: 55. 1864. *Callistemon salignus* f. *sieberi* (DC.) Siebert & Voss, Vilm. Blumengärtn. ed. 3, 1: 312. 1896. TYPE: Australia. New South Wales: 1825, *F. W. Sieber 637* (lectotype, designated by Lumley & Spencer, 1988: 413, G not seen; isotypes, PRC, W both not seen).

A new epithet is required as *sieberi* is preempted in *Melaleuca* by *M. sieberi* Schauer. The epithet *paludicola* is derived from the Latin "palus," swamp or marsh, and "-cola," inhabitant or dweller.

15. Melaleuca pearsonii (R. D. Spencer & Lumley) Craven, comb. nov. Basionym: *Callistemon pearsonii* R. D. Spencer & Lumley, Muelleria 6: 293, f. 1. 1986. TYPE: Australia. Queensland: Blackdown Tableland, Mimosa Creek, 14 Oct. 1984, *R. D. Spencer 84* (holotype, MEL; isotypes, BRI not seen, NSW).

16. Melaleuca phoenicea (Lindley) Craven, comb. nov. Basionym: *Callistemon phoeniceum* Lindley, Bot. Reg. App., Vols 1–23, x. 1839. TYPE: Australia. Western Australia: *J. Drummond s.n.* (lectotype, designated here, CGE not seen: isotype, CGE photo).

The type material in CGE consists of material of two collections mounted on the same sheet, that designated lectotype above and *J. Mangles s.n.* The Mangles collection is less adequate than Drummond's as it is in the late bud/flower expansion stage of development, whereas the Drummond specimen is in full flower.

17. Melaleuca pityoides (F. Mueller) Craven, comb. nov. Basionym: *Callistemon pityoides* F. Mueller, Australas. Chem. Drugg., Suppl. 5: 94. 1883. *Callistemon sieberi* var. *pityoides* (F. Mueller) Cheel, in J. H. Maiden, Forest Fl. N.S.W. 7: 59, in obs. 1917. TYPE: Australia. Victoria: Ovens River, Dec. 1882, *C. L. F. Falck s.n.* (lectotype, designated by Lumley & Spencer, 1988: 414, MEL).

18. Melaleuca polandii (F. M. Bailey) Craven, comb. nov. Basionym: *Callistemon polandii* F. M. Bailey, Queensland Fl. 6: 2003, pl. 88. 1902. TYPE: Australia. Queensland: Bloomfield River Mission Station [received at BRI, Jan. 1902], *W. Poland s.n.* (holotype, BRI).

19. Melaleuca recurva (R. D. Spencer & Lumley) Craven, comb. nov. Basionym: *Callistemon recurvus* R. D. Spencer & Lumley, Muelleria 7: 255, f. 2. 1990. TYPE: Australia. Queensland: Mt. Stewart, E of Herberton, on granite, May 1977, *R. Russell s.n.* (holotype, BRI).

20. Melaleuca rugulosa (Schlechtendal ex Link) Craven, comb. nov. Basionym: *Metrosideros rugulosa* Schlechtendal ex Link, Enum. Pl. Hort. Berol. Alt. 2: 27. 1822. *Callistemon rugulosum* (Schlechtendal ex Link) DC., Prodr. (DC.) 3: 223. 1828. TYPE: Germany. Cultivated in Berlin Botanic Garden, 1826, *C. F. Otto s.n.* (neotype, designated by Lumley & Spencer, 1988: 411, G-DC not seen).

21. Melaleuca salicina Craven, nom. nov. Replaced name: *Metrosideros saligna* Smith, Trans. Linn. Soc. London, Bot. 3: 272. 1797. *Callistemon salignum* (Smith) Sweet, Hort. Brit. 155. 1826. TYPE: Australia. New South Wales [Precise locality not known], *leg. ign. s.n.* (holotype, LINN not seen; isotypes, K, LIV).

A new epithet is required as *saligna* is preempted in *Melaleuca* by *M. saligna* (J. F. Gmelin) Blume. The epithet *salicina* has a similar meaning to "saligna" (willow-like) and also is derived from the generic epithet of the willow genus, *Salix*.

22. Melaleuca shiressii (Blakely) Craven, comb. nov. Basionym: *Callistemon shiressii* Blakely, Austral. Nat. 10: 257. 1941. TYPE: Australia. New South Wales: Narara [1.6 km W of railway station], 26 Dec. 1929, *W. F. Blakely & D. W. C. Shiress s.n.* (holotype, NSW; isotype, CANB).

Wilson (pers. comm., 1996) has provided some insights into the typification of this species: "the protologue reads, in part, 'W. F. Blakely and D. W. C. Shiress, 5/1927, and 26/2/1929, the type.' I take the wording to indicate that the second specimen is to be considered as holotype. There is, however, no specimen that matches this precisely, but there is one that is dated 26/12/1929 and I am convinced that this is the intended type, the date in the protologue being a typographic error. (In fact, our copy of the journal has a '1' pencilled in before the 2.)" Wilson's interpretation is accepted for the type citation above.

23. Melaleuca subulata (Cheel) Craven, comb. nov. Basionym: *Callistemon subulatus* Cheel, Proc. Linn. Soc. New South Wales 50: 259. 1925. TYPE: Australia. New South Wales: bed of the Nattai River, via Colo, Oct. 1912, *E. Cheel s.n.* (holotype, NSW).

24. Melaleuca virens Craven, nom. nov. Replaced name: *Metrosideros viridiflora* Sims, Bot. Mag. 52: t. 2602. 1825. *Callistemon viridiflorum* (Sims) Sweet, Hort. Brit. (Sweet) 155. 1826. *Callistemon salignus* var. *viridiflorus* (Sims) F. Mueller, Fragm. 4: 55. 1864. *Callistemon salignus* f. *viridiflorus* (Sims) F. Mueller ex Siebert & Voss, Vilm. Blumengärtn. ed. 3, 1: 312. 1896. TYPE: Cultivated in England, the provenance being Australia (lectotype, designated here, Sims, Bot. Mag. 52: t. 2602. 1825).

A new epithet is required as *viridiflora* is preempted in *Melaleuca* by *M. viridiflora* Solander ex Gaertner. The word "virens" is derived from the Latin "viridis," green, in reference to the replaced epithet. A specimen has not been located, and the name is here lectotypified by the plant and description.

25. Melaleuca williamsii Craven, nom. nov. Replaced name: *Callistemon pungens* Lumley & R. D. Spencer, Muelleria 7: 253, f. 1. 1990. TYPE: Australia. New South Wales: ca. 0.3 km along road to Armidale from jct. with road from the Armidale/Dorrigo Road to Hillgrove (ca. 4 km from hwy.), 21 Nov. 1983, *P. F. Lumley 1150* (holotype, MEL; isotypes, CANB, K not seen, NE, NSW not seen).

A new specific epithet is required as *pungens* is preempted in *Melaleuca* by *M. pungens* Schauer. The new epithet is in memory of John Beaumont Williams (1932–2005) of Armidale, New South Wales, who generously made available to me his extensive field knowledge of this group of plants as it occurs in the New England region of New South Wales.

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Literature Cited

Álvarez, I. & J. F. Wendel. 2003. Ribosomal ITS sequences and plant phylogenetic inference. Molec. Phylogen. Evol. 29: 417–434.

Baillon, H. E. 1876. *Melaleuca* L. Hist. Pl. (Baillon) 6: 359–360.

Barlow, B. A. 1986. *Melaleuca* L. Pp. 935–946 *in* J. P. Jessop & H. R. Toelken (editors), Flora of South Australia, Vol. 2. South Australian Government Printing Division, Adelaide.

Bentham, G. 1866 [1867]. *Myrtaceae*. Pp. 1–289 *in* Flora Australiensis, Vol. 3. Lovell Reeve, London.

Blake, S. T. 1958. New and critical genera and species of *Myrtaceae* subfamily *Leptospermoideae* from eastern Australia. Proc. Roy. Soc. Queensland. 69: 75–88.

———. 1968. A revision of *Melaleuca leucadendron* and its allies (Myrtaceae). Contr. Queensland Herb. 1: 1–114.

Briggs, B. G. & L. A. S. Johnson. 1979. Evolution in the *Myrtaceae*—Evidence from inflorescence structure. Proc. Linn. Soc. New South Wales 102: 157–256.

Brown, G. K., F. Udovicic & P. Y. Ladiges. 2001. Molecular phylogeny and biogeography of *Melaleuca*, *Callistemon* and related genera (Myrtaceae). Austral. Syst. Bot. 14: 565–585.

Brown, R. 1812. *Melaleuca paludosa*. Pp. 410–411 *in* W. T. Aiton (editor), Hortus Kewensis, Vol. 4. London.

———. 1814. General remarks, geographical and systematical, on the botany of Terra Australis. Pp. 533–594 *in* M. Flinders (editor), A Voyage to Terra Australis, Vol. 2. G. and W. Nicol, London.

Butcher, P. A., J. C. Doran & M. U. Slee. 1994. Intraspecific variation in leaf oils of *Melaleuca alternifolia* (Myrtaceae). Biochem. Syst. Ecol. 22: 419–430.

———, M. Byrne & G. F. Moran. 1995. Variation within and among the chloroplast genomes of *Melaleuca alternifolia* and *M. linariifolia* (Myrtaceae). Pl. Syst. Evol. 194: 69–81.

Byrnes, N. B. 1984. A revision of *Melaleuca* L. (Myrtaceae) in northern and eastern Australia, 1. Austrobaileya 2: 65–76.

Carrick, J. & K. Chorney. 1979. A review of *Melaleuca* L. (Myrtaceae) in South Australia. J. Adelaide Bot. Gard. 1: 281–319.

Cheel, E. 1924. Notes on *Melaleuca*, with descriptions of two new species and a new variety. J. Proc. Roy. Soc. New South Wales 43: 189–197.

———. 1925. Two new species of *Callistemon*, with notes on certain other species. Proc. Linn. Soc. New South Wales 50: 259–266.

——— & C. T. White. 1924. On a new species of *Melaleuca* (family Myrtaceae) from southern Queensland. Proc. Roy. Soc. Queensland 36: 41–43.

Craven, L. A. & J. W. Dawson. 1998. *Callistemon* of New Caledonia transferred to *Melaleuca* (Myrtaceae). Adansonia, sér. 3 20: 191–194.

——— & B. J. Lepschi. 1999. Enumeration of the species and infraspecific taxa of *Melaleuca* (Myrtaceae) occurring in Australia and Tasmania. Austral. Syst. Bot. 12: 819–927.

Dawson, J. W. 1978. Pacific capsular Myrtaceae 13, *Melaleuca* and *Callistemon* (New Caledonia). Blumea 24: 119–122.

———. 1992. *Melaleuca* Linné, *Callistemon* R. Brown. Pp. 216–245 *in* Flore de la Nouvelle-Calédonie et Dépendances, Vol. 18. Muséum National d'Histoire Naturelle, Paris.

Fuertes Aguilar, J., J. A. Rosselló & G. N. Feliner. 1999. Molecular evidence for the compilospecies model of reticulate evolution in *Armeria* (Plumbaginaceae). Syst. Biol. 48: 735–754.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

James, S. H. 1958. Apomixis in the Genus *Callistemon* R. Br. M.Sc. Thesis, Univ. Sydney.

Johnson, L. A. S. & B. G. Briggs. 1983. Myrtaceae. Pp. 175–185 *in* B. D. Morley & H. R. Toelken (editors), Flowering Plants in Australia. Rigby Press, Adelaide.

Ladiges, P. Y., G. I. McFadden, N. Middleton, D. A. Orlovich, N. Treloar & F. Udovicic. 1999. Phylogeny of *Melaleuca*, *Callistemon*, and related genera of the *Beaufortia* suballiance (Myrtaceae) based on 5.8 S and ITS-1 spacer regions of nrDNA. Cladistics 15: 151–172.

Lumley, P. F. & R. D. Spencer. 1988. Nomenclatural notes on *Callistemon* R. Br. (Myrtaceae). Muelleria 6: 411–415.

——— & ———. 1990. Two new species of *Callistemon* R. Br. (Myrtaceae). Muelleria 7: 253–257.

Molyneux, W. 1993. A new species of *Callistemon* R. Br. (Myrtaceae) from East Gippsland. Muelleria 8: 61–64.

Mueller, F. 1853. The vegetation of the districts surrounding Lake Torrens. Hooker's J. Bot. Kew Gard. Misc. 5: 105–109.

———. 1858. *Callistemon paludosus*. Fragm. 1: 14.

———. 1864. *Callistemon salignus*. Fragm. 4: 54–55.

Orlovich, D. A., A. N. Drinnan & P. Y. Ladiges. 1999. Floral development in *Melaleuca* and *Callistemon* (Myrtaceae). Austral. Syst. Bot. 11: 689–710.

Rye, B. L. 1979. Chromosome number variation in the Myrtaceae and its taxonomic implications. Austral. J. Bot. 27: 547–573.

Spencer, R. D. 1996. *Callistemon*, *Melaleuca*. Pp. 1022–1034 *in* N. G. Walsh & T. J. Entwisle (editors), Flora of Victoria, Vol. 3. Inkata Press, Melbourne.

——— & P. F. Lumley. 1986a. *Callistemon* R. Br. Pp. 894–897 *in* J. P. Jessop & H. R. Toelken (editors), Flora of South Australia, Vol. 2. South Australian Government Printing Division, Adelaide.

——— & ———. 1986b. Two new species of *Callistemon* R. Br. (Myrtaceae). Muelleria 6: 293–298.

——— & ———. 1991. *Callistemon*. Pp. 168–173 *in* G. J. Harden (editor), Flora of New South Wales, Vol. 2. Univ. New South Wales Press, Sydney.

W3Tropicos, ver. 1.5. 2006. Index to Plant Chromosome Numbers. http://mobot.mobot.org/W3T/Search/ipcn.html, accessed 10 September 2006.

Wilson, P. G., M. M. O'Brien, M. M. Heslewood & C. J. Quinn. 2005. Relationships within Myrtaceae sensu lato based on a *mat*K phylogeny. Pl. Syst. Evol. 251: 3–19.

Senecio glandulifer (Senecioneae, Asteraceae): Una Nueva Especie del Nordeste de Argentina

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Resumen. Se describe e ilustra *Senecio glandulifer* Dematteis & Cristóbal (Asteraceae), una nueva especie de los bosques abiertos del nordeste de Argentina. La nueva entidad pertenece al complejo *S. pinnatus* y se diferencia de las especies afines por la presencia de pelos glandulares y las hojas semi-carnosas. Además, *S. glandulifer* presenta número cromosómico $2n = 40$, lo cual la distingue de su especie estrechamente relacionada *S. pinnatus* Poiret, que muestra $2n = 80$.

Abstract. The new species *Senecio glandulifer* Dematteis & Cristóbal (Asteraceae) from the open forest of northeastern Argentina is described and illustrated. The new entity belongs to the *S. pinnatus* complex, and it is distinguished from related species by the glandular hairs and somewhat fleshy leaves. In addition, *S. glandulifer* presents a chromosome number of $2n = 40$, which distinguishes it from the closely related *S. pinnatus* Poiret with $2n = 80$.

Key words: Argentina, Asteraceae, *Senecio*.

El género *Senecio* L. (Senecioneae, Asteraceae) con alrededor de 3000 especies conocidas, es probablemente uno de los grupos más grandes en cuanto a número y distribución de las plantas vasculares (Cabrera et al., 1999). Es un género que habita en todos los continentes, excepto el Antártico, pero se halla distribuido principalmente en América y África. La mayoría de las especies habitan en regiones montañosas, existiendo pocas entidades distribuidas en las sabanas y selvas tropicales. Las especies de *Senecio* habitualmente poseen una distribución geográfica reducida y en general está ligada a una comunidad vegetal o a un tipo de ambiente determinado (Cabrera, 1957).

En Argentina el género está representado por alrededor de 274 especies, la mayoría de las cuales habita en la Patagonia y las montañas del noroeste del país (Cabrera et al., 1999; Tombesi, 2001; Bartoli et al., 2004; Tortosa & Bartoli, 2005). El nordeste de Argentina, que se caracteriza por presentar llanuras con clima subtropical, presenta relativamente pocas especies de *Senecio* (Cabrera & Ihárlegi, 1999). En esta región crecen 16 especies del género, la mayoría de las cuales tiene como centro de distribución el sur de Brasil. En el presente trabajo se presenta una nueva especie de *Senecio* que crece exclusivamente en los bosques abiertos del nordeste de Argentina.

Senecio glandulifer Dematteis & Cristóbal, sp. nov. TIPO: Argentina. Corrientes: Dept. San Roque, Ruta 23, 3 km W del Río Santa Lucía, 9 Nov. 1978, *A. Schinini & O. Ahumada 16003* (holotipo, CTES; isotipos, BAB, C, ENCB, F, G, MEXU, MO, UC, WIS, Z). Figuras 1, 2A.

Haec species *Senecio pinnato* Poiret similis sed foliis carnosis, pedunculis et phyllariis glanduloso-pubescentibus differt. Folia glutinosa, profunde pinnatisecta, utrinque laxe pubescentia, plerumque glandulosa; capitula radiata, longe pedunculata, corymbosa; pedunculis 2–3(–5) cm longis, dense glandulosis; phyllaria 16 ad 20, glanduloso-pubescentia; flores marginales 8 ad 10, feminei, corolla ligulata, 8–10 mm longa; flores disci 22 ad 30, hermaphroditi, corolla tubulosa, 5.3–6 mm longa; pappus albidus, 5–6(–6.8) mm longus.

Sufrútice de 20–40 cm de altura; tallos ascendentes, arqueados, estriados, grisáceos, ramificados desde la base, inferiormente cicatricosos, glanduloso-pubescentes en la parte superior. Hojas alternas, carnosas, sésiles, profundamente pinnatisectas, glutinosas, con pelos lanosos dispersos, frecuentemente también con pelos glandulares; segmentos 3 a 6(7), lineares o linear-lanceolados, enteros, agudos en el ápice, de 1–12(20) × 0.5–1 mm, raquis de 3–7 cm × 1–3 mm. Capítulos radiados, largamente pedunculados, dispuestos en una cima corimbiforme laxa, 4- a 10-céfala; pedúnculos de 2–3(5) cm, cubiertos densamente de pelos glandulares. Involucro acampanado, de 7–9 mm de altura, 6–8 mm de diám.; filarios 16 a 20, lanceolados o lineares, agudos, glanduloso-pubescentes en el dorso, laxamente lanosos hacia el ápice, de 6–9(–10) mm; flores amarillas, dimorfas; flores marginales 8 a 10, femeninas, corola ligulada, de 8–10 mm, lígula elíptica, tridentada en el ápice, de 5–6 mm, tubo infundibuliforme, de 3–4 mm; flores del disco 22 a 30, hermafroditas, corola tubulosa, de 5.3–6 mm, diferenciada en un tubo corto, estrecho y limbo ensanchado, lóbulos triangulares, de 0.40–

Figura 1. *Senecio glandulifer* Dematteis & Cristóbal. —A. Planta. —B. Hoja. —C. Sección de un pedúnculo. —D. Capítulo. —E. Flor central. —F. Flor marginal. —G. Aquenio con papus. —H–I. Filarios. Drawn from *Schinini & Ahumada 16003*, CTES.

0.45 mm; anteras con apéndice conectival ovado, obtusas en la base, de 2.3–2.5 mm; estilo de 5.2–5.5 mm, ramas truncadas en el ápice, con una corona de pelos colectores, de 0.6–0.8 mm. Papus blanco, uniseriado, formado por ca. 60 cerdas simples, de 5–6(–6.8) mm; aquenios cilíndricos, costados, de 3.6–4 mm, densamente pubescentes, con pelos dobles, cortos, redondeados en el ápice.

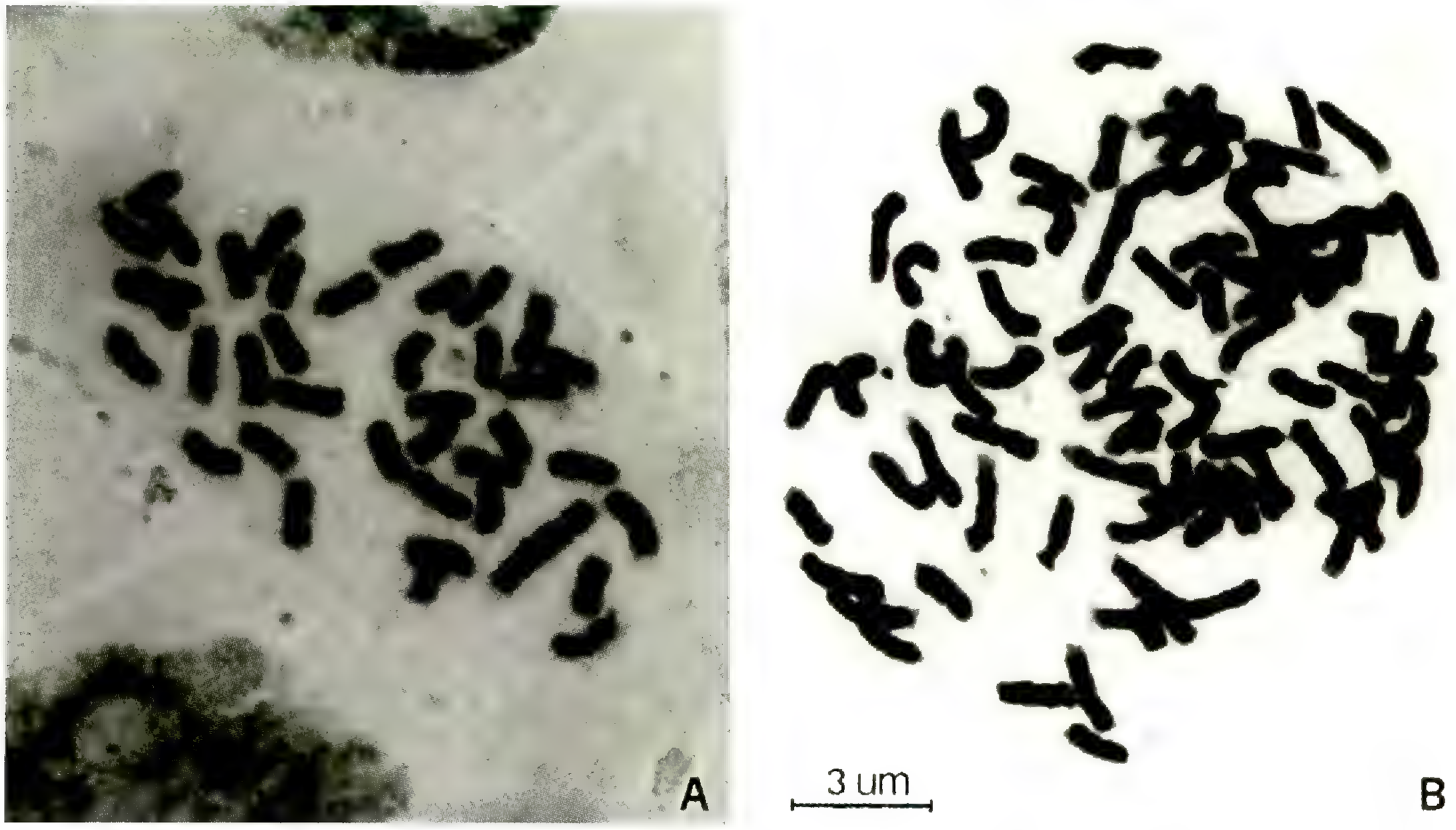

Figura 2. Cromosomas somáticos de *Senecio*. —A. Metafase mitótica de *S. glandulifer*, $2n = 4x = 40$ (*Dematteis & Schinini* 527, CTES). —B. Prometafase mitótica de *S. pinnatus*, $2n = 8x = 80$ (*Dematteis & Schinini 514*, CTES). Escala sirve para A y B.

Distribución y habitat. La nueva entidad se distribuye en el nordeste de Argentina, abarcando el este de la provincia de Chaco, norte de Entre Ríos, sudeste de Formosa y la mayor parte de la provincia de Corrientes. Se la encuentra principalmente en bosques abiertos con suelo arenoso y a veces salitroso; por lo general resulta más frecuente en la periferia que en el interior de los bosques. Según la clasificación propuesta por Cabrera (1971), esta especie habita en las provincias fitogeográficas del Espinal y Chaqueña. La primera región se caracteriza por tener un estrato arbóreo de 6–7 metros de altura, con *Prosopis affinis* Sprengel como especie dominante. En la provincia Chaqueña, las especies arbóreas pueden llegar hasta casi 25 metros de altura y la entidad característica es *Schinopsis balansae* Engler, acompañado entre otras especies por *Aspidosperma quebracho-blanco* Schlechtendal, *Astronium balansae* Engler y *Ruprechtia laxiflora* Meisner.

Fenología. Florece generalmente desde julio a noviembre, pero algunos individuos se pueden encontrar todavía con frutos durante los meses de diciembre, enero y febrero.

Número cromosómico. $2n = 40$ (Fig. 2A).

Los límites del género *Senecio* han variado considerablemente desde la descripción original realizada por Linné en 1753. En los tratamientos más actuales, se han elevado a rango genérico algunas de las secciones tradicionales del género (Nordenstam, 1978; Jeffrey, 1992). Según la clasificación infragenérica sugerida por Jeffrey (1992), *S. glandulifer* pertenecería a la sección *Corymbosi* Cabrera del subgénero *Senecio*. En tanto que, de acuerdo al último tratamiento de las especies argentinas de *Senecio* (Cabrera et al., 1999), esta nueva especie pertenecería a la sección *Senecio* ser. *Corymbosi* (Cabrera) Cabrera subser. *Brasilienses* (Cabrera) Cabrera & S. Freire. Esta subserie agrupa a sufrútices glanduloso-pubescentes o tomentosos, con hojas pinnatisectas y capítulos radiados dispuestos en cimas corimbiformes.

Entre las especies de la subserie *Brasilienses*, la nueva entidad se encuentra más estrechamente relacionada a *Senecio pinnatus* Poiret, de la cual puede diferenciarse claramente por el tipo de indumento. *Senecio glandulifer* posee pelos glandulares en pedúnculos, filarios y a veces en las hojas, lo que hace que el follaje de la planta sea glutinoso. Por su parte, *S. pinnatus* es casi siempre una planta glabra, aunque ocasionalmente puede presentar algunos pelos simples dispersos y muy escasos. Otra diferencia importante entre ambas especies es la consistencia de las hojas en el material vivo, que en *S. glandulifer* es más suculenta que en *S. pinnatus*.

Clave para Distinguir *Senecio glandulifer* y Especies Relacionadas

1a. Capítulos reunidos en cimas corimbiformes densas . . . . . *S. desideratus* DC.
1b. Capítulos en cimas corimbiformes laxas, a veces solitarios.
2a. Hojas con 1 a 2 pares de segmentos, a veces enteras . . . *S. pinnatus* var. *simplicifolius* Cabrera

2b. Hojas con 3 a 7 pares de segmentos.
3a. Involucro de 7–9 mm de alt.
4a. Tallos y hojas glabros, raramente con algunos pelos simples dispersos . . . . . *S. pinnatus* Poiret var. *pinnatus*
4b. Tallos y hojas nunca glabros.
5a. Pedúnculos y tallos jóvenes lanosos . . . . *S. goldsackii* Philippi
5b. Pedúnculos y tallos jóvenes glandulosos . . . . . *S. glandulifer* Dematteis & Cristóbal
3b. Involucro de 5–7 mm de alt . . . . . *S. gilliesianus* Hieronymus

Debido a las semejanzas morfológicas entre la nueva especie y *Senecio pinnatus*, durante el presente estudio se decidió analizar cromosómicamente también a esta entidad a los efectos de obtener caracteres adicionales que permitan separar a las dos entidades. El número de cromosomas de *S. pinnatus* (Fig. 2B) difiere del hallado en la nueva entidad, ya que presenta $2n = 80$, lo cual sugiere que sería octoploide considerando que el número básico de cromosomas del género es $x = 10$ (Ornduff et al., 1963). Por su parte, *S. glandulifer* posee $2n = 40$ cromosomas y sería tetraploide con $x = 10$. Este mismo número de cromosomas somáticos se ha encontrado en la mayoría de las especies relacionadas a *S. glandulifer*, tales como *S. brasiliensis* (Sprengel) Lessing (Coleman, 1968; Waisman et al., 1984), *S. gilliesianus* Hieronymus (Covas & Schnack, 1946; Hunziker et al., 1985), *S. glaber* Lessing (Hunziker et al., 1990), *S. grisebachii* Baker (Waisman et al., 1984; Dematteis & Fernández, 1998) y *S. pampeanus* Cabrera (Bernardello, 1986). Además de *S. pinnatus*, el único taxón afín a *S. glandulifer* que no posee $2n = 40$ es *S. uspallatensis* Hooker & Arnott, que de acuerdo a Hunziker et al. (1989) también es octoploide con $2n = 80$.

Paratipos. ARGENTINA. **Chaco:** Dept. 1° de Mayo, Col. Benítez, *A. G. Schulz 122a*, *8363*, *9471*, *14598* (todos CTES); Margarita Belén, *A. G. Schulz 2675*, *16072* (todos CTES); Dept. Bermejo, Las Palmas, *P. Jörgensen 2026* (BA); Dept. San Fernando, Basail, *T. Meyer 2061* (BA). **Corrientes:** Dept. Capital, Ruta 12, Riachuelo, *R. Carnevali 546* (CTES); Riachuelo, *C. L. Cristóbal & A. Schinini 1022* (AAR, CTES, G, LP); Paraje km 13, *A. Schinini 5388* (CTES, G, LP); Dept. Empedrado, Est. El Plata, *T. M. Pedersen 12016* (CTES, SI); Dept. Esquina, Col. Libertador, arroyo Barrancas, *A. Krapovickas 27794* (CTES); Dept. Lavalle, Ruta 12, 20 km S de ruta 123, *M. Dematteis & A. Schinini 527* (CTES), *A. Krapovickas & C. L. Cristóbal 46516* (CTES, K, TEX); Dept. Mburucuyá, Est. Santa Teresa, campo Dios Gracia, *T. M. Pedersen 1870* (CTES, S no visto); Dept. Mercedes, Camino de Mercedes a Paso de los Libres y Río Miriñay, *A. Schinini, S. G. Tressens & R. O. Vanni 18664* (CTES); Dept. Paso de los Libres, 20 km NW de Paso de los Libres, cruce rutas 129 y 123, *O. Ahumada & A. Schinini 4021* (CHR, CTES, MO); Ruta 23, 2 km E del Río Miriñay, *A. Schinini, C. L. Cristóbal & R. Carnevali 7253* (CTES); Dept. Saladas, Ruta 17 y Río Santa Lucía, *O. Ahumada, A. Schinini & S. G. Tressens 3609* (CTES); Dept. San Cosme, Desvío a Puerto González, 9 km del cruce con el camino a Paso de la Patria, *S. G. Tressens, B. Benítez, J. Bissio, C. L. Cristóbal, A. Fernández, L. Mroginski, S. M. Pire & H. Pueyo 207* (BAB, CTES, LP); Dept. San Luis del Palmar, Lomas de González, *A. Schinini, M. S. Ferrucci & R. O. Vanni 17772* (CTES). **Entre Ríos:** Dept. La Paz, Paso Yunque, peladares, *A. Burkart et al. 25507* (SI); Paso Yunque, *A. Burkart 27118* (LP, SI); cercanías de Paso Yunque, Arroyo Guayquiraró, *J. D. Muñoz 2815* (CTES). **Formosa:** Formosa, *P. Jörgensen 3355* (SI); Apr. 1919, *P. Jörgensen s.n.* (BA 25103); Dept. Laishi, Est. El Bagual, Col. Presidente Irigoyen, 25 km al W de San Francisco de Laishi, *A. Di Giácomo 92* (CTES).

Literatura Citada

Bartoli, A., R. D. Tortosa & S. E. Freire. 2004. *Senecio nemiae* (Asteraceae, Senecioneae), a new species from Sierra Grande in Patagonia (Argentina). Novon 14: 25–28.

Bernardello, L. M. 1986. Números cromosómicos en Asteraceae de Córdoba. Darwiniana 27: 169–178.

Cabrera, A. L. 1957. El género *Senecio* (Compositae) en Brasil, Paraguay y Uruguay. Arch. Jard. Bot. Rio de Janeiro 15: 161–326.

———. 1971. Fitogeografía de la República Argentina. Bol. Soc. Argent. Bot. 14: 1–42.

——— & L. Iharlegui. 1999. Asteraceae, *Senecio*. Pp. 281–314 *en* F. O. Zuloaga & O. Morrone (editores), Catálogo de las Plantas Vasculares de la República Argentina, Vol. II. Monogr. Syst. Bot. Missouri Bot. Gard. 74: 281–314.

———, S. E. Freire & L. Ariza Espinar. 1999. Asteraceae XIII. Tribu Senecioneae. Pp. 3–164 *en* A. T. Hunziker (editor), Flora Fanerogámica Argentina, Vol. 62. Museo Botánico de Córdoba.

Coleman, J. R. 1968. Chromosome numbers in some Brazilian Compositae. Rhodora 70: 228–240.

Covas, G. & B. Schnack. 1946. Número de cromosomas en Antófitas de la región de Cuyo (República Argentina). Revista Argent. Agron. 13: 153–166.

Dematteis, M. & A. Fernández. 1998. Estudios cromosómicos en dos especies de *Senecio* (Asteraceae). Bol. Soc. Argent. Bot. 33: 181–184.

Hunziker, J. H., C. C. Xifreda & A. F. Wulff. 1985. Estudios cromosómicos en Angiospermas de Sudamérica. Darwiniana 26: 7–14.

———, A. F. Wulff, C. C. Xifreda & A. Escobar. 1989. Estudios cariológicos en Compositae. V. Darwiniana 29: 25–39.

———, A. Escobar, C. C. Xifreda & J. C. Gamerro. 1990. Estudios cariológicos en Compositae. VI. Darwiniana 30: 115–121.

Jeffrey, C. 1992. The tribe Senecioneae (Compositae) in the Mascarene Islands with an annotated world check-list of the genera of the tribe. Kew Bull. 47: 49–109.

Nordenstam, B. 1978. Taxonomic studies in the tribe Senecioneae (Compositae). Opera Bot. 44: 1–83.

Ornduff, R., P. H. Raven, D. W. Kyhos & A. R. Kruckeberg. 1963. Chromosome numbers in Compositae. III. Senecioneae. Amer. J. Bot. 50: 131–139.

Tombesi, T. S. 2001. Novedades en *Senecio* (Senecioneae, Asteraceae). Hickenia 3(30): 111–114.

Tortosa, R. D. & A. Bartoli. 2005. Two new species of *Senecio* (Asteraceae, Senecioneae) from Argentina. Novon 15: 646–649.

Waisman, C. E., E. Rozenblum & J. H. Hunziker. 1984. Estudios cariológicos en Compositae. I. Darwiniana 25: 217–226.

A New Species of *Dendropanax* (Araliaceae) from the State of Espírito Santo, Brazil

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Abstract. *Dendropanax caudatus* Fiaschi, a new species from the rain forests of Espírito Santo, Brazil, is here described and illustrated. It resembles *D. bahiensis* Fiaschi, from which it can be distinguished by its smaller fruits and by the leaf blades, which have caudate to long-acuminate apices.

Resumo. *Dendropanax caudatus* Fiaschi, uma espécie nova de matas ombrófilas do Espírito Santo, Brasil, é aqui descrita e ilustrada. Esta espécie é provavelmente relacionada a *D. bahiensis* Fiaschi, da qual pode ser distinta pelos frutos menores, e pelas lâminas foliares com ápice caudado a longo-acuminado.

Key words: Araliaceae, Brazil, *Dendropanax*, Espírito Santo, IUCN Conservation Status.

Dendropanax Decaisne & Planchon comprises ca. 100 species from tropical and subtropical Asia and Central and South America (Frodin & Govaerts, 2004). The majority of these (ca. 70 species) occur in the Americas, where they are best represented in the rain forests of northwestern South America, with secondary centers of diversity in southern Mesoamerica, Jamaica, and eastern Brazil (Frodin & Govaerts, 2004; Fiaschi, 2005).

Species of *Dendropanax* are glabrous plants with simple (sometimes palmatilobed) leaves, often 3-nerved at the base and having schizogenous glands and small intrapetiolar stipules; the inflorescences are simple or more or less compoundly arranged umbels of unjointed, pedicellate 5- to 9-merous flowers with valvate petals, glandular and versatile anthers, and fruits that sometimes have a distinct stylar column (Cannon & Cannon, 2001; Hutchinson, 1967).

Molecular evidence suggests that *Dendropanax* belongs to the Asian Palmate clade of Araliaceae, perhaps close to *Hedera* L. (Wen et al., 2001; Plunkett et al., 2004). Lowry et al. (2004) have suggested that the generic delimitation of *Dendropanax* may also require recircumscription to render it monophyletic.

Dendropanax caudatus Fiaschi, a new species endemic to the rain forests of Espírito Santo state, is here described and illustrated, and its ecological aspects and putative affinities are discussed.

Dendropanax caudatus Fiaschi, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, Rio Saltinho, terreno do Tranhago, 450 m, 13 Apr. 2003 (fl, fr), *P. Fiaschi, R. Oliveira, I. Andrade, M. Andrade & L. Kollmann 1473* (holotype, CEPEC; isotypes, F, HUEFS, K, MBML, MO, NY, SPF). Figure 1.

Species nova fructibus minoribus, lamina apicibus caudatis vel longi-acuminatis a *Dendropanax bahiense* Fiaschi differt.

Shrubs 1.5–3.5 m high; young branches 2.5–4 mm diam., striate longitudinally. Leaves spirally alternate, sometimes sub-opposite, terminally congested in 2–6 cm growth modules; stipules up to ca. 2 mm, entire; petiole 1.5–10 cm, slightly compressed laterally, adaxially plane, uniformly thick; blade spreading, plane, membranous, dotted with schizogenous cavities visible with transmitted light, 8.5–23.5 × 3–7 cm, elliptic to narrowly elliptic, symmetric to slightly asymmetric, the apex caudate to long-acuminate, the base cuneate (obtuse), the margin entire or with up to 4 pairs of teeth less than 1 mm on distal half, plane; venation acrodromous and suprabasal, imperfect, brochidodromous, the main vein prominent on both surfaces, more so abaxially, the secondary veins in 6 or 7 pairs, slightly prominent on abaxial surface; the basal pair almost indistinct, diverging from midvein at up to ca. 2 mm from blade base, angle of divergence 30 –40 , the other pairs with angle of divergence 50 – 60 , intersecondary veins present, clearly thinner than secondary ones, sometimes almost perpendicular to the main vein, the tertiary veins and reticulation inconspicuous to slightly visible on abaxial surface. Inflorescences terminal, erect, the main axis reduced, to ca. 1 cm; the primary branches 5 or 6, 0.8–2 cm, umbellate or densely clustered and pseudoumbellate, erect, sometimes with 1 to 3 alternate to sub-opposite bracts; umbels 15- to 25-flowered. Flowers light

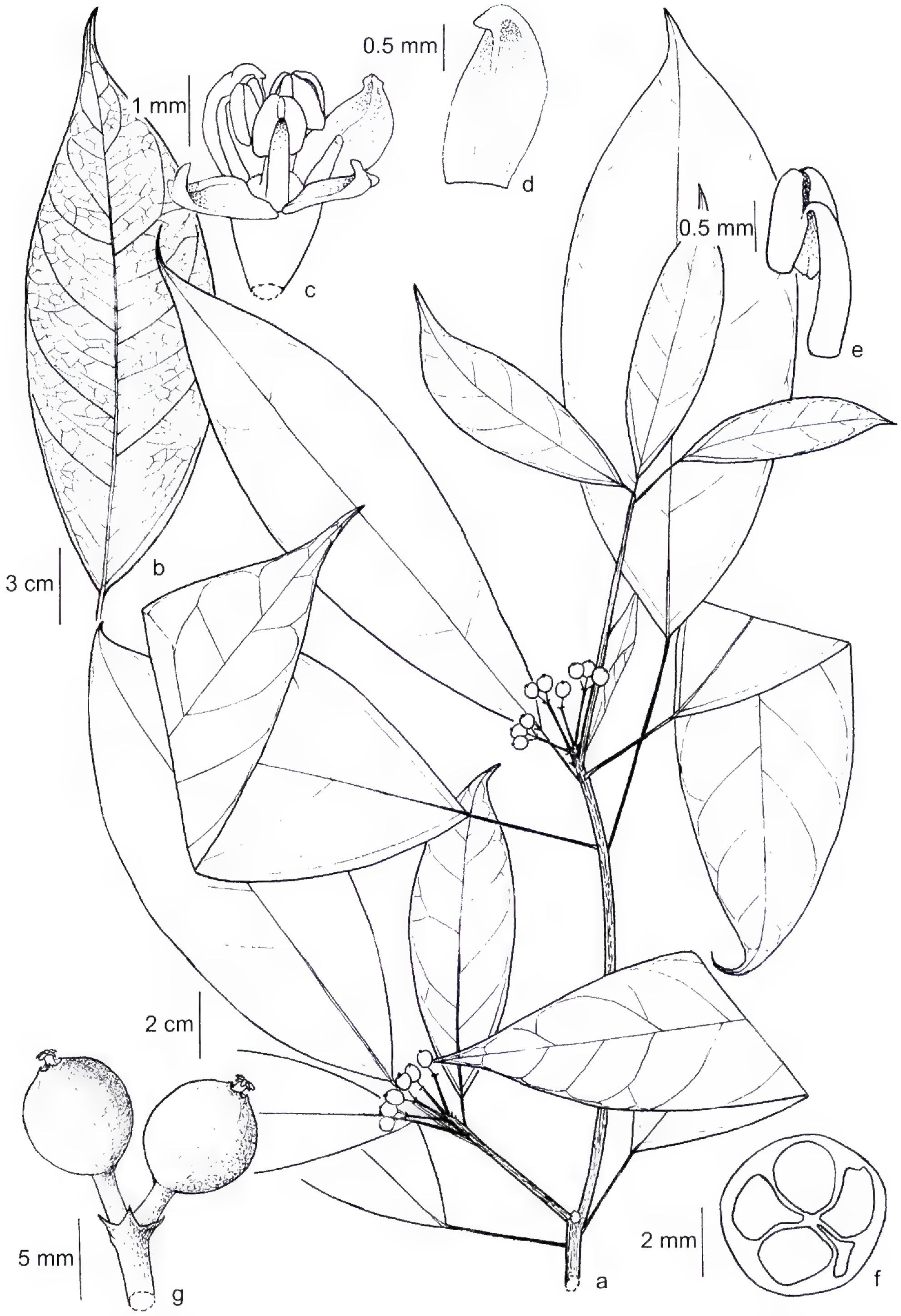

Figure 1. *Dendropanax caudatus* Fiaschi. —a. Fruiting branch. —b. Leaf undersurface. —c. Flower. —d. Petal, adaxial view. —e. Stamen, abaxial view. —f. Transverse section of the fruit. —g. Fruits on infructescence axes. Drawings based on the holotype, *P. Fiaschi et al. 1473* (CEPEC).

green, the pedicel 1–2 mm, elongating to 2.5–5 mm in fruit; hypanthium ca. 1.2 mm, shorter than corolla; calyx lobes 4 or 5, evident, acuminate; petals 4 or 5, 1.8–2 × 1–1.4 mm, elliptic to ovate, the apex cucullate; stamens 4 or 5, white, the filaments 1.6–1.8 mm, the anthers versatile, 1–1.1 × 0.7–0.8 mm, dorsally glandular at apex; styles 4 or 5, 0.2–0.4 mm, ovary 4- to 5-carpellate. Fruits spherical, 4- to 5-lobed when dried, 7–7.5 × 6–7.5 mm, the stylar column ca. 0.5 mm; pyrenes 4 or 5, ca. 6 × 3 mm.

Habitat and distribution. *Dendropanax caudatus* is known from elevations of 110–450 m, inhabiting patches of rain forest in the vicinity of the municipalities of Cachoeiro do Itapemirim and Santa Teresa, in the state of Espírito Santo, Brazil. Due to the apparent rarity and restricted distribution of *D. caudatus*, it seems prudent to include this species in the endangered category of the IUCN Red List of endangered plant species according to the following criteria (IUCN, 2001): EN B1ab (i, ii, iii).

Dendropanax caudatus shares several characters with *D. bahiensis* and *D. exilis* (Toledo) S. L. Jung, including a shrubby habit, membranous leaves abaxially dotted with schizogenous cavities and reduced simple or branched inflorescences with primary branches up to 3.5 cm long. This species group is endemic to the subcanopy of the Atlantic rain forests of eastern Brazil, ranging from Bahia to Santa Catarina (Fiaschi, 2005). *Dendropanax caudatus* appears to be closely related to *D. bahiensis*, from which the new species may be distinguished by its smaller fruits (7–7.5 × 6–7.5 mm vs. 9–10 × 10–10.5 mm) and leaf blades with an apex caudate to long-acuminate (vs. acute to short-acuminate).

Paratypes. BRAZIL. **Espírito Santo:** Cachoeiro do Itapemirim, Pacotuba, Res. Flor. Bananal do Norte, *D. Sucre & T. Soderstron 8999* (CEPEC, RB, SPF); Santa Teresa, Rio Saltinho, terreno do Tranhago, *L. Kollmann, E. Bausen & W. Pizziolo 1477* (MBML, SPF).

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Literature Cited

Cannon, M. J. & J. F. M. Cannon. 2001. Araliaceae. Pp. 189–192 *in* W. D. Stevens, C. Ulloa Ulloa, A. Pool & O. M. Montiel (editors), Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Gard., Vol. 85.

Fiaschi, P. 2005. Three new species of *Dendropanax* (Araliaceae) from the state of Bahia, Brazil. Brittonia 57: 240–247.

Frodin, D. G. & R. Govaerts. 2004. World Checklist and Bibliography of Araliaceae. The Royal Botanic Gardens, Kew.

Hutchinson, J. 1967. The Genera of Flowering Plants (Angiospermae). Vol. 2. Clarendon Press, Oxford.

IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.

Lowry II, P. P., G. M. Plunkett & J. Wen. 2004. Generic relationships in Araliaceae: Looking into the crystal ball. S. African J. Bot. 70: 382–392.

Plunkett, G. M., J. Wen & P. P. Lowry II. 2004. Infrafamilial classifications and characters in Araliaceae: Insights from the phylogenetic analysis of nuclear (ITS) and plastid (*trn*L-*trn*F) sequence data. Pl. Syst. Evol. 245: 1–39.

Wen, J., G. M. Plunkett, A. D. Mitchell & S. J. Wagstaff. 2001. The evolution of Araliaceae: A phylogenetic analysis based on ITS sequences of nuclear ribosomal DNA. Syst. Bot. 26: 144–167.

Three New Species of *Elvasia* (Ochnaceae) from the Brazilian Atlantic Forest, with an Emended Key for Subgenus *Hostmannia*

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Abstract. Three new species of *Elvasia* DC. (*E. gigantifolia* Fraga & Saavedra, *E. kollmannii* Fraga & Saavedra, and *E. capixaba* Fraga & Saavedra) from the Brazilian Atlantic forests of Espírito Santo are described and illustrated. The diagnostic characters of each species and their similarities with other species are discussed. In addition, this paper provides an emended key for species of subgenus *Hostmannia* (Planchon) Planchon.

Resumo. São descritas e ilustradas três novas espécies de Elvasia DC. (*E. gigantifolia* Fraga & Saavedra, *E. kollmannii* Fraga & Saavedra e *E. capixaba* Fraga & Saavedra) originárias da floresta atlântica brasileira no Espírito Santo. Os caracteres diagnósticos e as semelhanças com outras espécies são discutidos para cada espécie. Em adição, este trabalho apresenta uma chave de identificação para as espécies do subgênero *Hostmannia* (Planchon) Planchon.

Key words: Atlantic rain forest, Brazil, *Elvasia*, Espírito Santo, Ochnaceae.

The eastern Brazilian Atlantic coastal forest, although at present highly fragmented, is known as having one of the highest biodiversities on Earth (Myers et al., 2000). Many of these forest fragments of special interest are located on the highland of Espírito Santo.

The Neotropical genus *Elvasia* DC. currently presents 11 species, with 10 species distributed in two subgenera, and *E. brevipedicellata* Ule uncertainly placed in the current subgeneric classification. The subgenus *Elvasia* presents 4 species that are characterized by star-shaped fruits and a distribution concentrated in the Amazon basin; the subgenus *Hostmannia* (Planchon) Planchon has 6 species that are characterized by globular fruits and a circum-Amazonian distribution. Within subgenus *Hostmannia*, only *E. bisepala* Sastre & Whitefoord extends into Central America and only *E. tricarpellata* Sastre was previously known as endemic to the eastern Brazilian Atlantic forest (Sastre et al., 1999).

As a result of fieldwork in the eastern Brazilian Atlantic coastal forest in Espírito Santo, we have found three new *Elvasia* species, belonging to the subgenus *Hostmannia*, that are described and illustrated in this paper. With the objective of enabling the identification of these species, an emended key for all species of this subgenus is provided.

1. Elvasia gigantifolia Fraga & Saavedra, sp. nov. TYPE: Brazil. Espírito Santo: Cariacica, Pau Amarelo, Agric. Cond. Cantinho do Céu, limit with State Biol. Res. Duas Bocas, 22 Dec. 1999 (fl), *C. N. Fraga 560* (holotype, MBML; isotypes, MO, P, RB). Figure 1.

Haec species *Elvasiae macrostipulari* Sastre & Lescure similis, sed foliorum laminis majoribus (24–35 × 8–9 cm vs. 18–24 × 7–10 cm), petiolis minoribus (0.8–1 cm vs. 1–2 cm), inflorescentiis majoribus (25–30 cm vs. ca. 10 cm) et petalis numero 5 versus 3 ad 4 differt.

Trees 10 m tall; stems glabrous, with lenticels. Leaves 24–35 × 8–9 cm, oblong to elliptic-oblong, coriaceous, base cuneate, apex acute, margin with minute glandular, black teeth, appearing undulate when dry, green; midvein sharply keeled adaxially, prominent and angled abaxially, secondary veins fine and parallel, perpendicular to midvein; petioles 8–10 mm; stipules 5–7 mm, triangular, margin minutely denticulate at base and rigid-fimbriate at apex. Inflorescence erect, terminal, thyrsoid, 25–30 cm; basal bracts similar to the stipules, distichous and imbricate, 6–9 mm, shallowly triangular, aristate

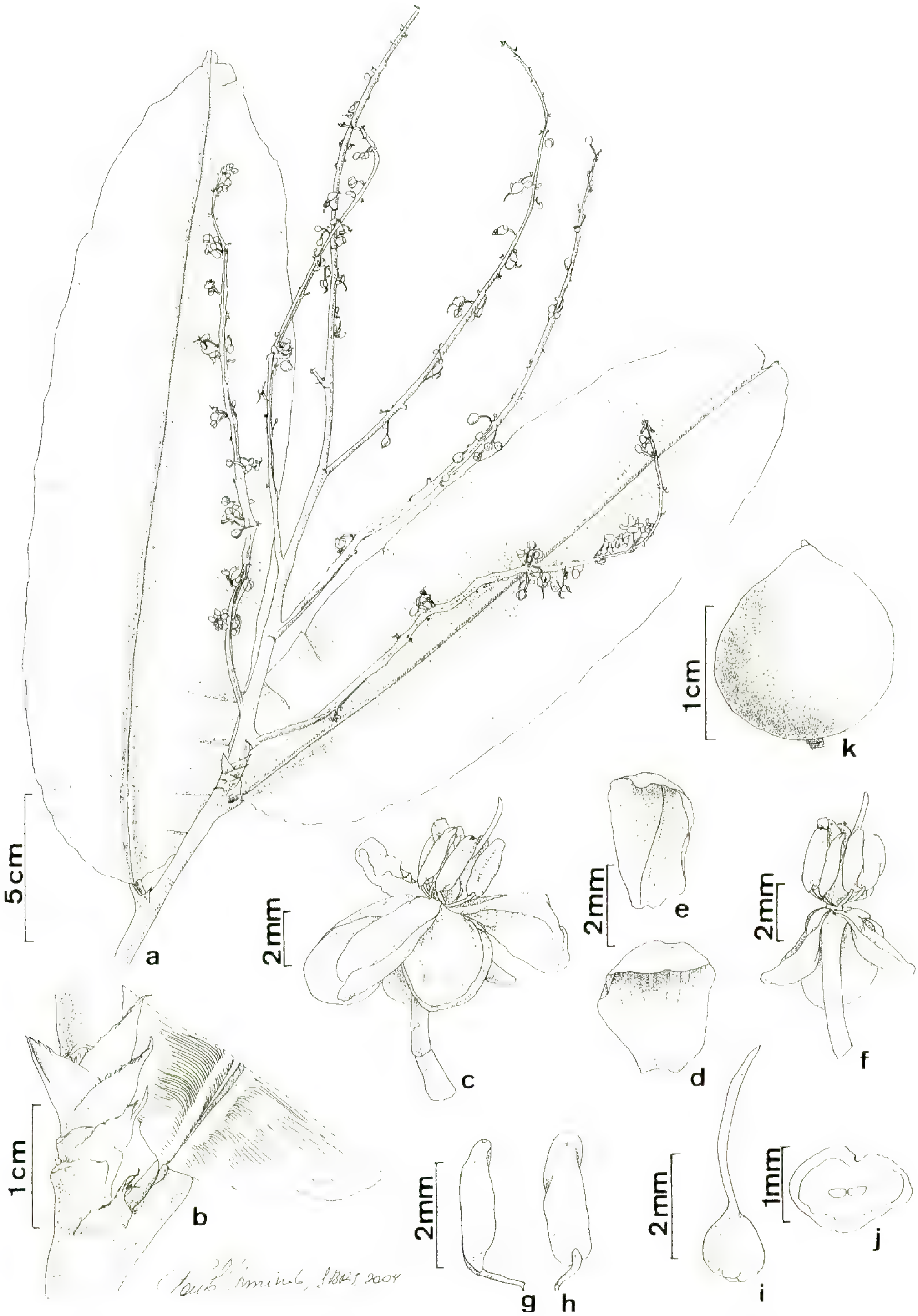

Figure 1. *Elrasia gigantifolia* Fraga & Saavedra. —a. Branches and inflorescence. —b. Stipules and bracts, detail. —c. Flower. —d. Sepal, adaxial side. —e. Petal, adaxial side. —f. Pedicel, sepals, stamens, and gynoecium in side view with petals and one sepal removed. –g. Stamen, side view. —h. Stamen, abaxial side. —i. Gynoecium, side view. —j. Ovary, transverse section. —k. Fruit, side view. a–j drawn from the holotype (*C. V. Fraga 560*, MBML) and k from the paratype (*C. V. Fraga 627*, MBML).

dorsally, apex bifid and fimbriate, often caducous; peduncles 3 to 7, 18–23 cm, distally curved; bract caducous at peduncle base, persistent at the base of the floral clusters, triangular, with cuspidate apex; floral bract triangular, apex cuspidate, 2 bracteoles partially concealed by floral bract; flowers clustered in groups of 2 to 5; pedicels 5–8 mm, articulate near the base. Flowers with sepals 4, glabrous, suborbiculate, externally verrucose, 2 external, coriaceous, 4–5.5 mm diam. and 2 internal, chartaceous, 5–5.5 mm diam.; petals 5, yellow, unequal, imbricate, 4–6 × 2–4.5 mm, obovate, membranous, internally a few somewhat coriaceous at the base and along the central vein; stamens 10 to 11, arranged in a circle around the ovary, occasionally 1 smaller, filaments 0.5–1 mm, anthers ca. 2–2.5 × 0.5–0.6 mm, dehiscence porose, connective dorsiventrally thickened; ovary 1–1.5 mm diam., rhombic, locules 2, 1-ovulate; style 3–3.5 mm, single, erect, flattened, apex appressed. Fruit 2-chambered but more often 1-seeded apparently through abortion, indehiscent, subglobular, ca. 1.5 cm diam., mucronate at the apex.

Etymology. The specific epithet refers to the large size of the leaves, which are among the largest in *Elvasia*.

Elvasia gigantifolia is similar to *E. macrostipularis*, sharing large leaves over 15 cm long, flowers with 10 or more stamens, and a 2-celled ovary. However, *E. gigantifolia* has leaves that are oblong to elliptic-oblong, exceeding 24 cm; petioles to 10 mm long and stipules 5–7 mm long; the inflorescences are erect, with the branches distally curved, 25–30 cm long; and the flowers have 5 petals. In contrast, *E. macrostipularis* has elliptic leaves, less than 24 cm long; with petioles over 10 mm long and stipules 7 10 mm long; the inflorescences are erect, with no curvature observed, ca. 10 cm long; and the flowers have 3 or 4 petals.

Paratype. BRAZIL. **Espírito Santo:** Mun. Cariacica, Pau Amarelo, Agric. Cond. Cantinho do Céu, limit with State Biol. Res. Duas Bocas, 13 May 2000, *C. N. Fraga 627* (MBML).

2. Elvasia kollmannii Fraga & Saavedra, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, headwater of Bonito River, land of the radar of the Aeronautics, 1030 m, 17 Aug. 2003 (fl, fr), *L. Kollmann 6523 & C. N. Fraga* (holotype, MBML; isotypes, MBM, MO, P, RB). Figure 2.

Haec species *Elvasiae elvasioidi* (Planchon) Gilg similis, sed foliorum lamina elliptica, apice acuto usque mucronato et petiolis majoribus (3–5 mm vs. ca. 1 mm), petalis albis, staminibus 8 ad 10 et filamentis antheris minoribus (ca. 0.5 mm vs. 2–3.6 mm) differt.

Trees 9 m tall; stems glabrous. Leaves 5.5–11 × 2.5–4.7 cm, elliptic, coriaceous, base attenuate, apex acute, mucronate, margin with minute glandular, black teeth, appearing slightly undulate when dry, green; midvein sharply keeled adaxially, prominent and angled abaxially, secondary veins fine and parallel, perpendicular to midvein; petiole 3–5 mm; stipules 2–3 mm, triangular, entire or apparently trifid with a stouter central division, appearing tattered and laciniate with age. Inflorescence erect, terminal, 3–13 cm, basal bracts caducous; peduncles 3 to 8, 1.5–6 cm, erect, ramified; bracts similar to the stipules, often caducous, ca. 3–5 mm, triangular, aristate dorsally, apex bifid and fimbriate; bract at the base of the floral clusters persistent, triangular, cuspidate at apex; floral bract triangular, cuspidate at apex, 2 bracteoles partially concealed by the floral bract; flowers clustered in groups of 2 or 3, very shortly pedunculate; pedicel 3–4 mm, articulate near the base. Flowers with sepals 4, externally verrucose, suborbiculate, coriaceous, 2 external ca. 2.5 mm diam. and 2 internal ca. 3 mm diam.; petals 4, white, imbricate, 4–5 × 3–4.5 mm, obovate, membranous, a few somewhat coriaceous at the base and along the central vein; stamens 8 to 10, arranged in a circle around the ovary, the filaments ca. 0.5 mm, the anthers ca. 1.5 × 0.5 mm, dehiscence porose, connective dorsiventrally thickened; gynoecium 4.3–5 mm; ovary slightly flattened, 1.8–2 × 2–2.5 mm, subglobular, locules 2, 1-ovulate; style 2.5–3 mm, single, erect, slightly flattened, apex appressed. Fruit 2-chambered but more often 1-seeded, apparently through abortion, indehiscent and globular, ca. 0.7 cm diam., when young, mucronate at the apex.

Etymology. The name of the new species pays homage to Ludovic Jean Charles Kollmann, who has made very important contributions, with his collections, to our knowledge of the flora of Santa Teresa, Espírito Santo state, Brazil.

Elvasia kollmannii is similar to *E. elvasioides*, sharing leaves that are less than 15 cm long, flowers with 4 sepals, 8 or more stamens, and a 2-celled ovary. However, *E. kollmannii* has elliptic-coriaceous leaves, with acute to mucronate apex; flowers with white petals, a unique character in *Elvasia*; and stamens 8 to 10 with filaments shorter than the anthers. In contrast, in *E. elvasioides* the leaves are obovate to ovate-elliptic or oblong to oblong-lanceolate, chartaceous, with acuminate apex, and the flowers have yellow petals, with over 15 stamens and filaments that are longer than the anther.

Paratype. BRAZIL. **Espírito Santo:** Santa Teresa, headwater of Bonito River, land of the radar of the

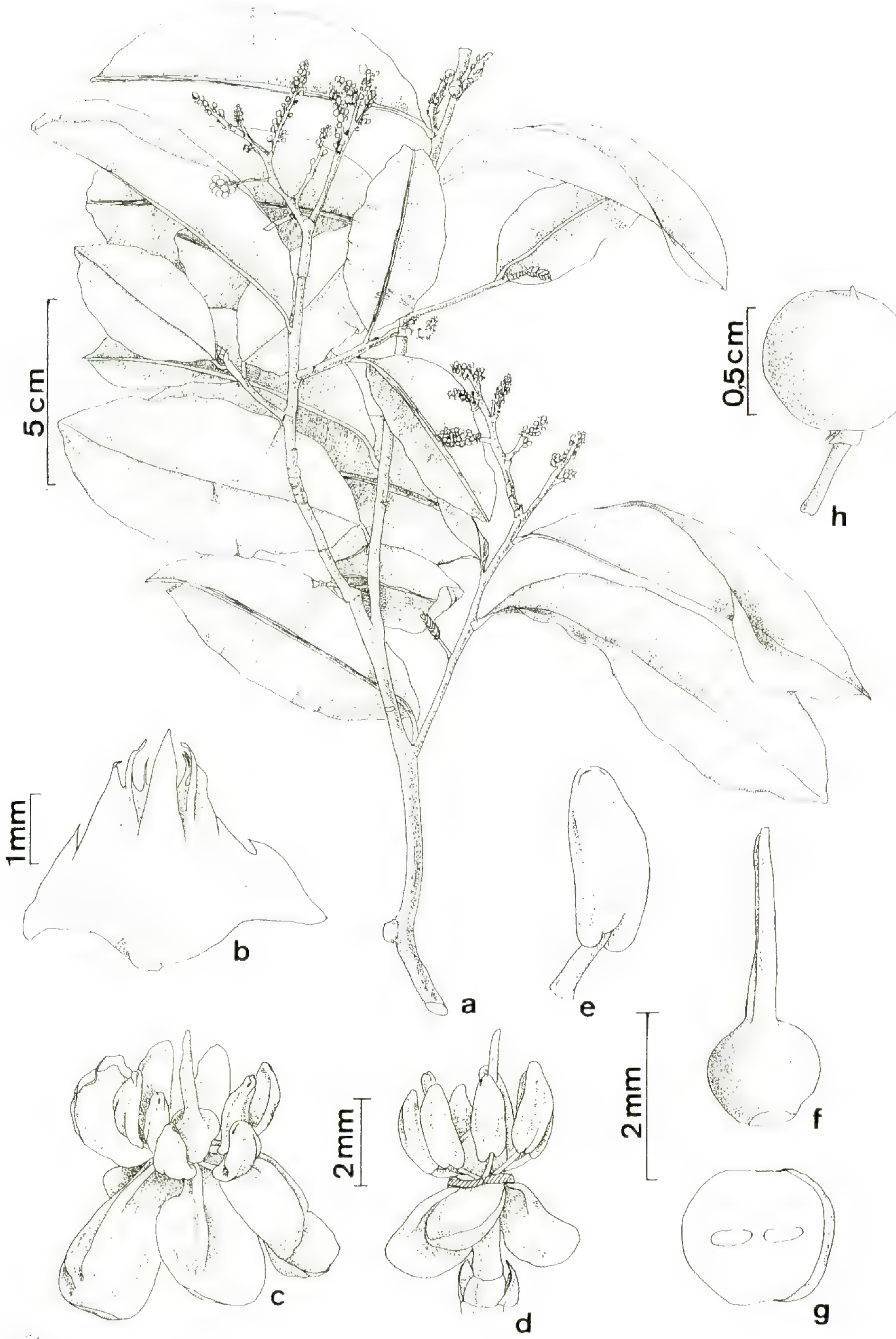

Figure 2. *Elrasia kollmannii* Fraga & Saavedra. —a. Branches and inflorescence. —b. Bract, abaxial side. —c. Flower. —d. Bracteoles, pedicel, sepals, stamens, and gynoecium in side view with petals removed. —e. Stamen, abaxial side. —f. Gynoecium, side view. —g. Ovary, transverse section. —h. Young fruit, side view. a, b drawn from the paratype (*L. Kollmann et al. 3872*, MBML) and c–h from the holotype (*L. Kollmann 6523 & C. N. Fraga*, MBML).

Aeronautics, 1030 m, 12 June 2001, *L. Kollmann 3872, E. Bausen & W. Pizziolo* (MBM, MBML, MO, P, RB).

3. Elvasia capixaba Fraga & Saavedra, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, Valsugana Velha, Santa Lúcia Biol. Station, right edge of Timbuí River, ca. 19°57′10″ to 19°59′00″S, 40°31′30″ to 40°32′25″W, 750 m, 13 Aug. 1990 (fl), *S. V. Pereira 23 & M. S. R. Cardoso* (holotype, MBML; isotypes, MBM, MO, P, RB). Figure 3.

Haec species *Elvasiae oligandrae* Cuatrecasas similis, sed foliorum lamina elliptica, coriacea, apice cuspidato vel acuminato, sepalis ovatis, petalis 5, suborbicularibus, staminibus 7, et antheris minoribus differt.

Trees 13 m tall, branches glabrous. Leaves 6–10 × 2–3.5 cm, elliptic, coriaceous, base attenuate, apex cuspidate or occasionally acuminate, margin with minute, glandular, black teeth, appearing slightly undulate when dry, green; midvein inconspicuous, sharply keeled adaxially and prominent abaxially, the secondary veins fine and parallel, perpendicular to midvein; petioles 4–6 mm; stipules 2–3 mm, triangular, trifid with a stouter central division, tattered and laciniate. Inflorescence paniculate on short peduncles, erect, terminal, 6–10 cm, basal bract caducous; peduncles 1 to 7, ca. 1–6.5 cm, erect, ramified, glabrous; bracts similar to the stipules, 2.5–3.5 mm, triangular, at the branch points and at the base of the flowers, aristate dorsally, apex bifid and fimbriate, often caducous; floral bract persistent, triangular, apex cuspidate; 2 bracteoles partially concealed by floral bract; flowers solitary; pedicel 1–1.5 mm, articulate near the base. Flowers with sepals 3, 3–3.5 × 2–2.5 mm, ovate, coriaceous; petals 5, yellow, imbricate, ca. 4 mm diam., sub-orbiculate, membranous, a few somewhat coriaceous at the base; stamens 7, arranged in a circle around the ovary, the filaments ca. 0.5 mm, the anther ca. 1.5 × 0.5 mm, dehiscence porose; gynoecium 1.5–1.8 mm; ovary ca. 0.5 mm diam., globular, locules 2, 1-ovulate; style 1–1.3 mm, single, base appressed, slightly flattened, somewhat arcuate at base. Fruit 2-chambered but most often 1-seeded apparently through abortion, indehiscent, transversally elliptic, 1.2–1.4 × 1.5–1.8 cm, mucronate at the apex.

Etymology. The specific epithet is a Brazilian Portuguese name of indigenous origin, referring to fertile land. The word is usually used for people born in the state of Espírito Santo, Brazil. The use of "capixaba" is supported by Article 23.2 of the *International Code of Botanical Nomenclature* (Greuter et al., 2000).

Elvasia capixaba is similar to *E. oligandra*; both have their leaves less than 15 cm long, the flowers with 3 sepals, 7 or fewer stamens, and a 2-celled ovary. However, the leaves of *E. oligandra* are elliptic-oblong, sub-coriaceous, 8–12 × 3–4 cm, with an acute or occasionally cuspidate apex, and the flowers have elliptic to rounded sepals, 3 elliptic petals, and 5 or 6 stamens with anthers ca. 3 mm long. In contrast, the leaves of *E. capixaba* are elliptic, coriaceous, 6–10 × 2–3.5 cm, with cuspidate or occasionally acuminate apices, and the flowers have ovate sepals, 5 sub-orbiculate petals, and 7 stamens with anthers ca. 1.5 mm long.

Paratype. BRAZIL. **Espírito Santo:** Santa Teresa, Valsugana Velha, Santa Lúcia Biol. Stat., 750 m, 3 Feb. 2004, *F. Zamborlini 27* (MBM, MBML, MO, P, RB).

KEY TO THE SPECIES OF *ELVASIA* SUBG. *HOSTMANNIA*

1a. Ovary 4- to 5-celled . . . . . *E. sphaerocarpa* R. S. Cowan
1b. Ovary 2- to 3-celled.
  2a. Ovary 3-celled.
    3a. Leaves elliptic to narrowly elliptic, 6–13 × 2.5–4 cm, with apex acuminate-cuspidate, inflorescence terminal on short peduncles, 7–9 cm long, branches minutely pubescent, sepals 2 (rarely 3) . . . . . *E. bisepala* Sastre & Whitefoord
    3b. Leaves elliptic to narrowly elliptic, 8–18 × 4–6 cm, with apex acute, inflorescence terminal on long peduncles, 6–20 cm, glabrous, sepals consistently 3 or 4 . . . . . *E. tricarpellata* Sastre
  2b. Ovary 2-celled.
    4a. Leaves over 18 cm long.
      5a. Leaves 24–35 × 8–9 cm, oblong to elliptic-oblong, petioles 8–10 mm long, inflorescences erect, curved in the terminal portion, 25–30 cm long, petals 5 . . . . . *E. gigantifolia* Fraga & Saavedra
      5b. Leaves 18–24 × 7–10 cm, elliptic, petioles over 10 mm long, inflorescences erect, ca. 10 cm long, petals 3 or 4 . . . . . *E. macrostipularis* Sastre & Lescure
    4b. Leaves to 15 cm long.
      6a. Flowers with 3 sepals, stamens 7 or fewer.
        7a. Leaves elliptic, coriaceous, 6–10 × 2–3.5 cm, apex cuspidate or occasionally acuminate, flowers with sepals ovate, 3–3.5 × 2–2.5 mm, petals 5, sub-orbiculate, ca. 4 mm diam., stamens 7, anthers ca. 1.5 × 0.5 mm . . . . . *E. capixaba* Fraga & Saavedra
        7b. Leaves elliptic-oblong, sub-coriaceous, 8–12 × 3–4 cm, apex abruptly acute and cuspidate, sepals elliptic to rounded, 4–5 × 3–3.5 mm, petals 3, elliptic, ca. 5 × 3 mm, stamens 5 to 6,

Figure 3. *Elrasia capixaba* Fraga & Saavedra. —a. Branches and inflorescence. —b. Flower bud. —c. Sepal, adaxial side. —d. Petal, adaxial side. —e. Stamen, side view. —f. Stamen, abaxial side. —g. Gynoecium, side view. —h. Ovary, transverse section. —i. Fruit, side view. a–h drawn from the holotype (*S. V. Pereira 23 & M. S. R. Cardoso*, MBML) and i from the paratype (*F. Zamborlini 27*, MBML).

anthers ca. 3 mm long . . . . . *E. oligandra* Cuatrecasas

6b. Flowers with 4 sepals, stamens 8 or more.

8a. Leaves elliptic, coriaceous, 5.5–11 × 2.5–4.7 cm, apex acute to mucronate, flowers with white petals, stamens 8 to 10, filaments ca. 0.5 cm, smaller than the anthers . . . . . *E. kollmannii* Fraga & Saavedra

8b. Leaves obovate to ovate-elliptic or oblong to oblong-lanceolate, 5–15 × 2–5 cm, apex acuminate, flowers with yellow petals, more than 15 stamens, filaments 2–3.6 mm long, larger than anthers . . . . . *E. elvasioides* (Planchon) Gilg

Acknowledgments. We thank Helio de Queiroz Boudet Fernandes, Director of Mello Leitão Biological Museum and Herbarium MBML curator, for access to type materials; Paulo Ormindo, for the illustrations; and the editor Victoria Hollowell and the anonymous reviewers for providing helpful critical comments on the manuscript.

Literature Cited

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Myers, N. R. A., C. G. Mittermeier, G. A. B. Fonseca & J. Kent. 2000. Biodiversity hot spots for conservation priorities. Nature 403: 853–858.

Sastre, C., C. Whitefoord & S. Knapp. 1999. A new species of *Elvasia* (Ochnaceae) from Mesoamerica with discussion of subgeneric classification and phytogeography. Novon 9: 253–256.

A New Species of *Baccharis* (Asteraceae, Astereae) from Santa Catarina, Brazil

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Abstract. A new species, *Baccharis coronata* Giuliano, from Santa Catarina, Brazil, is described and illustrated. This species, belonging to section *Oblongifoliae*, is distinguished by its axillary compound corymbs crowned by the upper leaves.

Resumen. Se describe e ilustra una nueva especie, *Baccharis coronata* Giuliano, de Santa Catarina, Brasil. Esta especie, perteneciente a la sección *Oblongifoliae*, se distingue por sus corimbos compuestos axilares coronados por las hojas superiores.

Key words: Asteraceae, *Baccharis*, Brazil, IUCN Conservation Status, Santa Catarina.

The genus *Baccharis* L. includes about 400 species (Bremer, 1994) distributed from the eastern and southwestern United States to southern Argentina and Chile. During the revision of its infrageneric taxonomy, some specimens from the state of Santa Catarina, Brazil, were found that did not match with any described species; consequently, a new species is proposed here.

Baccharis coronata Giuliano, sp. nov. TYPE: Brazil. Santa Catarina: Mun. Bom Retiro, Campo dos Padres, 2000 m, 16 Dec. 1918, *R. Reitz 2122* (holotype, LP). Figure 1.

Baccharidi brachylaenoidi affinis, sed capitulis in corymbis compositis axillaribus foliis apicalibus coronatis differt.

Erect shrubs 2–5 m tall, non-resinous, clothed with uniseriate conic hairs with pedestal on young organs, glabrous at maturity; branches conspicuously marked by the insertions of caducous leaves. Leaves alternate, crowded at the apex of branches, narrowly elliptic or slightly obovate, base attenuate, apex apiculate, margins minutely crenate, pinnately nerved, 4–8.4 × 0.9–1.4 mm. Capitula pedunculate, arranged in compound corymbiform cymes placed at the axils of leaves that are caducous at the maturity of the heads; the capitulescence is crowned by the apical persistent leaves. Receptacles of carpellate capitula conic, alveolate, with linear, acute, caducous paleae; involucres campanulate, 5–6 × 6 mm; phyllaries in 2 to 3 series, acute, glabrous, the outer ovate and the inner lanceolate or oblong. Florets 18 to 20; corolla filiform, 3–3.5 mm, irregularly denticulate at apex, outside with biseriate hairs in the apical 1/3; style exserted, with linear branches. Achenes of carpellate capitula strongly compressed, ellipsoid or obovoid, with 5 or 6 longitudinal ribs, 2–2.5 mm, with sparse twin hairs placed near the apex; pappus uniseriate, persistent, slightly accrescent. Receptacles of staminate capitula conic, alveolate, without paleae; involucres campanulate, 4–5 × 4–5 mm; phyllaries in 2 to 3 series, acute or obtuse, similar to those of carpellate capitula. Florets 15 to 23; corolla 3–3.5 mm, with biseriate hairs on the apical portion of the tube and the basal portion of the limb; limb campanulate, 5-lobed at apex, lobes 0.5–1 mm; style obtrullate at apex, with branches separate at maturity. Achenes of staminate capitula rudimentary; pappus bristles not broadened at apex.

The name of this species refers to the leaves, which are densely arranged, crowning the apex of the branches. The description of the species is based on the carpellate plant of the holotype and the staminate and carpellate collections of the paratypes.

Baccharis coronata belongs to section *Oblongifoliae* by virtue of the indument of uniseriate conic hairs, pinnately to sub-reticulate nerved leaves, the staminate florets with obtrullate style apex with branches separated at maturity, the paleaceous receptacles of carpellate capitula, and the compressed 5-ribbed achenes with sparse twin hairs (Giuliano, 2001; Oliveira & Marchiori, 2005). It is closely related to *B. brachylaenoides* DC. by leaf and involucre morphology; however, both species chiefly differ in their capitulescence architecture: axillary compound corymbiform cymes crowned by the upper leaves in the former, and a terminal panicle in the latter.

The species is known solely from the localities of Brusque and Campo dos Padres in the state of Santa Catarina, Brazil, where it grows in campos and capoeiras at 400–2000 m.

Paratypes. BRAZIL. **Santa Catarina:** Brusque, *R. Reitz 2271* (LP); Mun. Bom Retiro, Campo dos Padres, Faz. Campo dos Padres, *L. B. Smith, R. Reitz & R. Klein 7720* (LP).

Acknowledgments. I am grateful to John Semple and an anonymous reviewer for their valuable

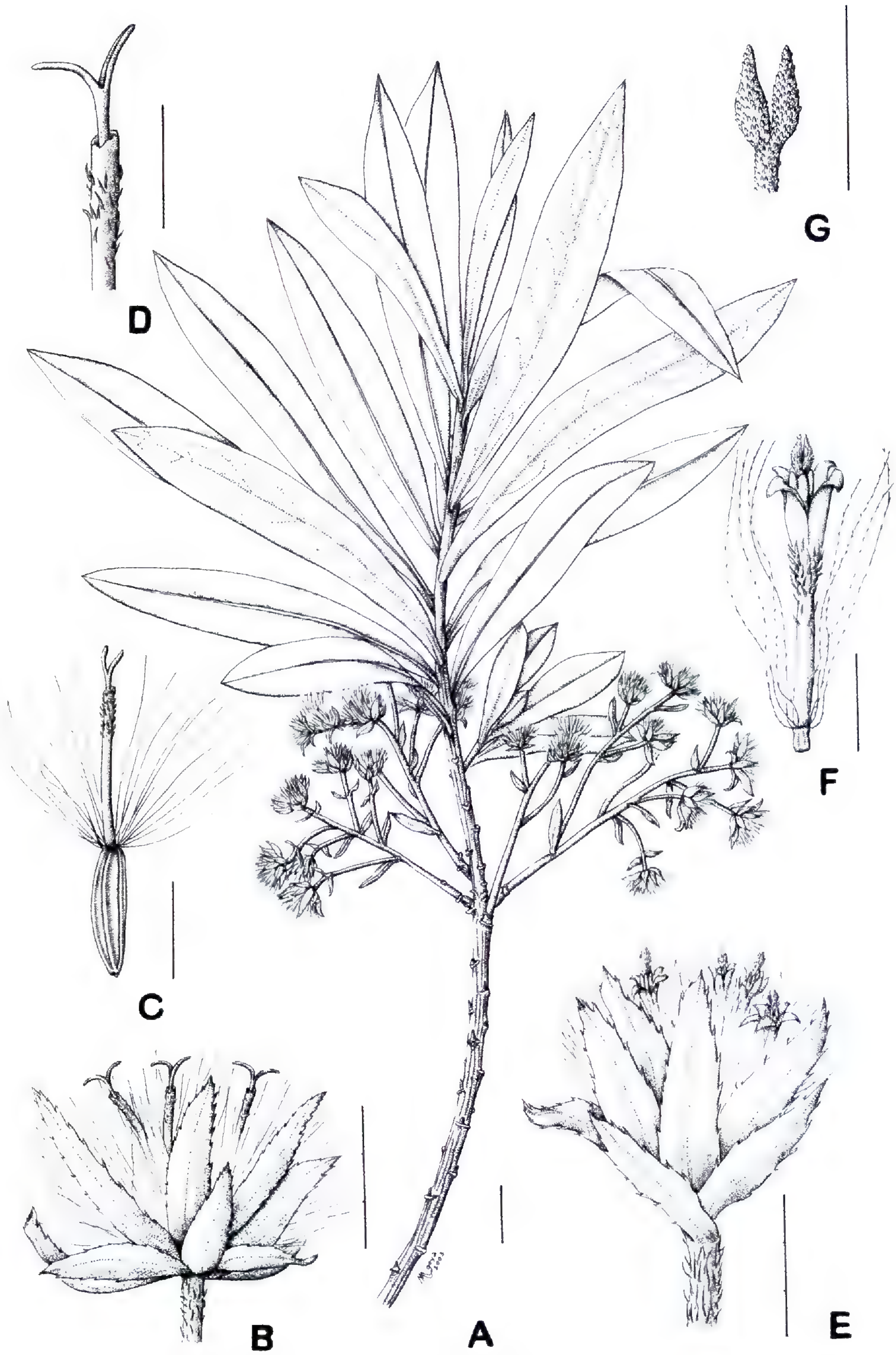

Figure 1. *Baccharis coronata* Giuliano. —A. Flowering branch. —B. Carpellate capitulum. —C. Carpellate floret. —D. Apex of carpellate floret. —E. Staminate capitulum. —F. Staminate floret. —G. Style tip of staminate floret. A–D from the holotype, *Reitz 2422*; E–G from a paratype, *Smith et al. 7720*. Scale bars = 1 cm (A), 3 mm (B and E), 1.8 mm (C), 1 mm (D and G), 1.2 mm (F).

comments on the manuscript, and to María Alejandra Migoya for the illustration.

Literature Cited

Bremer, K. 1994. Asteraceae—Cladistics and Classification. Timber Press, Portland.

Giuliano, D. A. 2001. Clasificación infragenérica de las especies argentinas de *Baccharis* (Asteraceae, Astereae). Darwiniana 39: 131–154.

Oliveira, A. S. de & J. N. C. Marchiori. 2005. O gênero *Baccharis* Linnaeus, seçâo Oblongifoliae DC. (Asteraceae–Astereae), no sul do Brasil. Balduinia 5: 6–15.

Taxonomic Identity of *Musa rosea* (Musaceae) in Southeast Asia

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Abstract. Since the 19th century, the taxonomic identity of *Musa rosea* Baker has been uncertain to most botanists. Review of the history and descriptions of *M. rosea* based on the work of different scientists from 1893 to the present was done to establish its true identity. *Musa angcorenis* Gagnepain has been even more obscure since the early 20th century. The aim of this study was to clarify the taxonomic history, identity, and the synonymy of *M. angcorensis* and *M. rosea*, with *M. angcorensis* determined to be a synonym of *M. rosea*. A lectotype of *M. rosea* is designated here, and *M. angcorensis* is synonymized to *M. rosea*.

Key words: *Musa*, Musaceae, Southeast Asia, wild banana.

Musa rosea Baker (Musaceae, Häkkinen & Scarrock, 2002) has long been a "lost species." The identity of *M. rosea* has been obscure since Baker's description of it in 1893. It has been regarded as a distinct taxon (Lestiboudois, 1841, 1842; Schnizlein, 1849; Baker, 1893; De Wildeman, 1912; Fawcett, 1913) and incorrectly regarded as a synonym of *M. ornata* Roxburgh [syn. *M. rosacea* Jacquin (1804)]. Speculation has taken place since that time as to whether *M. rosea*, itself synonomized to *M. rosacea*, is an independent species or not (Cheesman, 1931, 1949). A similar situation has existed for *M. angcorensis* Gagnepain since 1907, almost a century (Simmonds, 1960; Champion, 1967).

The Kew botanist John Gilbert Baker described the species in 1893 from two sketches drawn from two sheets (a sketch and a plant specimen), dated June 1882, in the herbarium of the Botanic Garden of Calcutta. *Musa rosea*, however, had been known long before Baker's publication, as evidenced by the letter from the assistant curator of the Botanic Garden of Calcutta, Robert Proudlock, to Kew curator William Watson. This letter, which was addressed to Baker and dated 10 July 1890, is in the Kew Garden archives. It reads:

"For Mr. Baker.

Musa rosea Proudlock writing from the Calcutta Bot. Gardens in reply to your question re' *Musa rosea*. Dr. King informs me that it is not *M. rosacea* but the true *M. rosea* Wallich. Dr. King thinks it is not in English gardens yet, and for many years he thought it was lost, but it has lately been found in the gardens here again."

"W. Watson, 10 – VII – 90."

(Sir George King was the Director of the Botanical Survey of India in 1878. Before that, he was the superintendent of the Botanic Garden of Calcutta.)

This letter demonstrates that the botanist Nathaniel Wallich (1786–1854), who worked at the Botanic Garden of Calcutta between 1814 and 1846, before Proudlock's tenure, knew of *Musa rosea* and its distinction from *M. rosacea* much earlier than Baker. Wallich did not mention *M. rosea* in his description of *M. ornata* in Roxburgh's (1824) *Flora Indica*; however, he made a footnote on page 489: "this is probably *M. rosacea* Jacq. which has been well figured in Edward's Botanical Register 9: 706 A and B. – N. W." The plate in the Botanical Register (1823) to which Wallich referred originated a mistake that has been maintained up to present. The plant depicted is certainly *M. ornata* Roxburgh, but the name *M. rosacea* Jacquin belongs to an entirely different plant, in *Musa* sect. *Musa* L. (Linnaeus, 1753). However, Baker omitted Wallich's name and his observations when he described and named *M. rosea* three years later. Wallich did not describe this species, but did contribute to the description of *M. rubra* Wallich ex Kurz (1865–1866; Häkkinen, 2003). Most of the wild banana species and names from India and the southeastern Asian continent are still taxonomically confused after their treatments by 19th-century botanists (Cheesman, 1931, 1947, 1949; Simmonds, 1960; Champion, 1967).

Baker described *Musa rosea* (1893: 2) as:

"Habit of *M. coccinea*, but leaves much shorter and broader in proportion to length, thin, green, about a foot long by half as broad, deltoid at the base and apex; petiole deeply channelled, nearly as long as the blade. Panicle short, erect; rachis pubescent, not flexuose; bracts pale red; lower lanceolate, half a foot long; flowers 2–3 in a cluster. Calyx an inch

Figure 1. Lectotype specimen of *Musa rosea* (CAL 469271).

long; petal as long as the calyx. Fruit and seeds not seen."

It seems clear to the author that Baker could not see the flower parts and bracts from the sketches done from the dried specimen, so he first reached the erroneous conclusion that the compound and free tepal lengths are equal. This is corrected later on the original voucher (CAL 469271 by R. S. Rao "(15.11.1957): Petals 2/5 to 1/3 length of the sepal"; Fig. 1).

Baker's reference to the "habit of *M. coccinea*" should have been taken from his description of *Musa rubra*, in which he describes the habit of *M. coccinea*. *Musa rubra* has persistent bracts, and in that respect it could be compared to *M. coccinea* (Häkkinen, 2003).

Only one citation (Lestiboudois, 1841: 16, plate 13; Fig. 2) for *Musa rosea* is listed for an illustration from *Index Londinensis* (Stapf, 1929–1931). The Lestiboudois illustration clearly represented *M. ornata*, which has very distinctive morpho-taxonomic marks. *Musa ornata* has a long free tepal, to 4 cm, compared to *M. rosea*, which has a very short free tepal, only to 1.2 cm. These distinctions can be seen easily from living samples and herbarium specimens.

After Baker's 1893 description, De Wildeman (1912: 353) says of *Musa rosea:*

"This species is described after documents that are in the Calcutta Herbarium. It is one of the oldest known in the Gardens of Europe. It was introduced in Europe by 1805, from the island of Mauritius." (Translated from the French.)

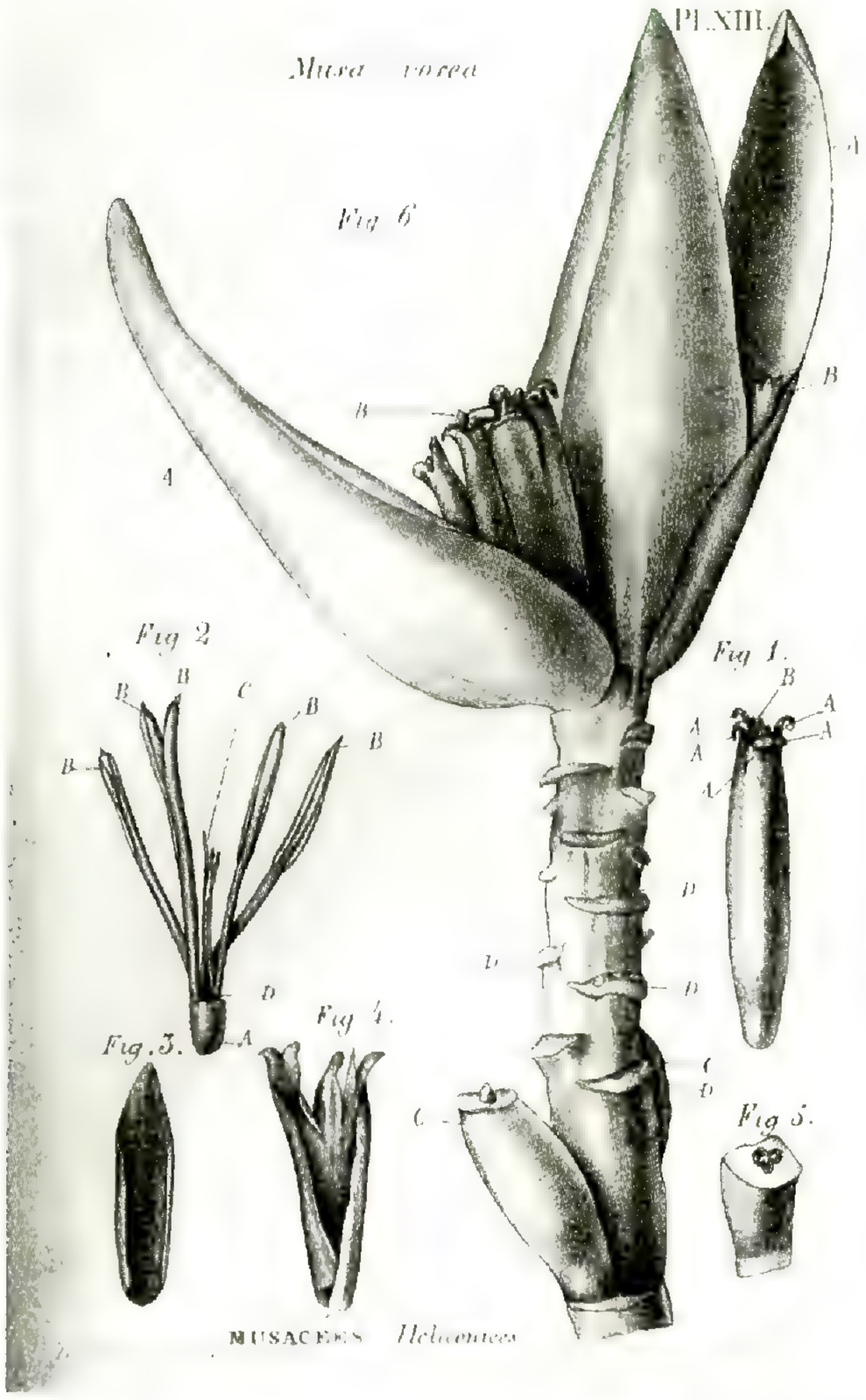

Figure 2. *Musa rosea* (*M. ornata*) drawing from *Mémoires de la Société Royale des Sciences, de l'Agriculture et des Arts de Lille* (Lestiboudois, 1841: plate 13).

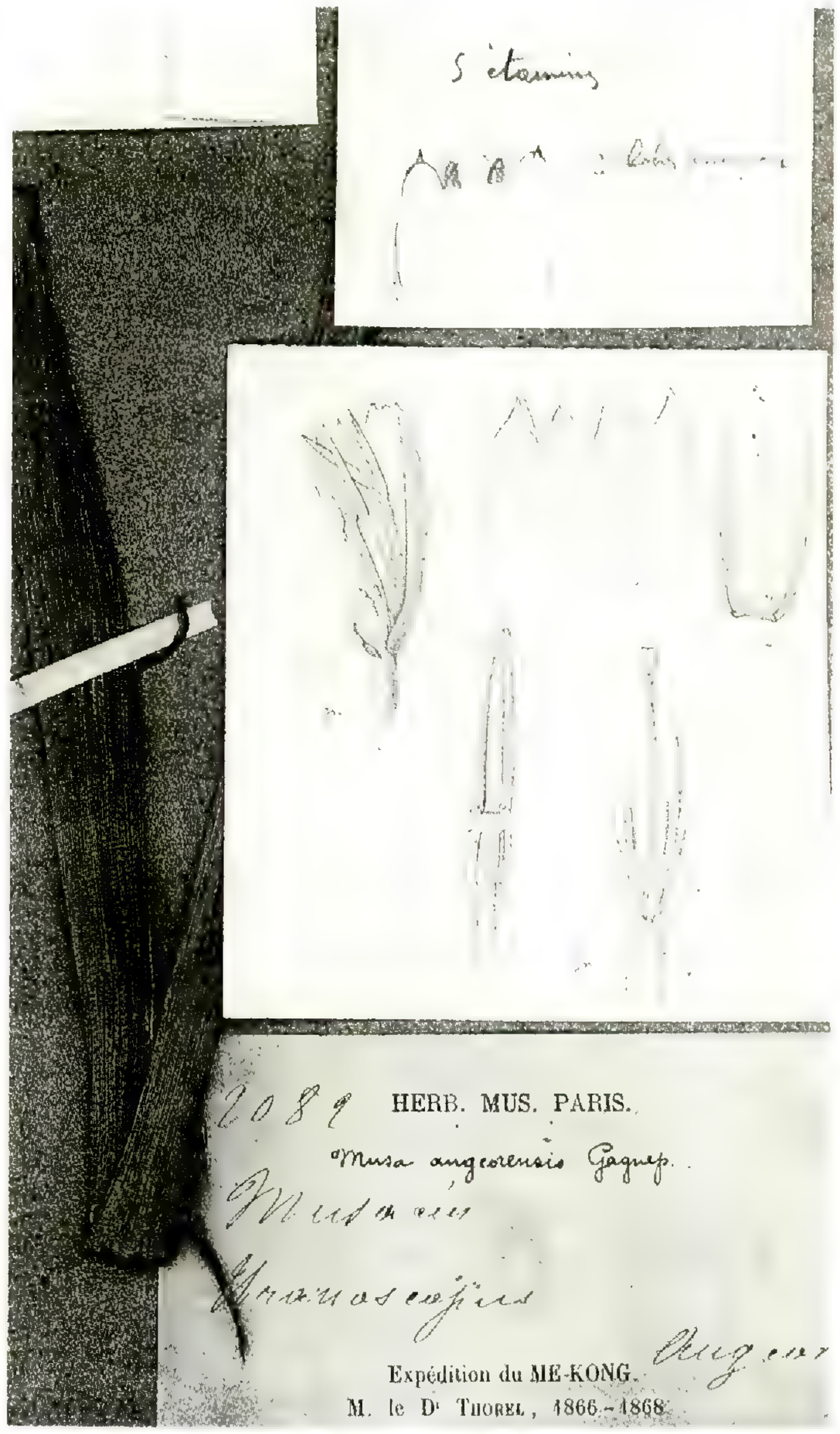

Figure 3. Lectotype specimen of *Musa angcorensis* (P 2082).

De Wildeman, like many other botanists, confused *Musa rosea* with *M. ornata*, which had been introduced from Mauritius in 1805. With regard to earlier-mentioned *M. rubra*, *M. ornata* is clearly a distinct species with its robust form and persistent bracts (vs. the dehiscent bracts in *M. rosea*).

Typification

The author has studied herbarium samples of *Musa angcorensis* and *M. rosea* at CAL, K, and P. Living plants of *M. rosea* have been studied at Singapore Botanical Garden, Singapore; Rimba Ilmu Botanical Garden, Kuala Lumpur, Malaysia; and the Botanic Garden of the University of Helsinki, Finland.

Musa rosea

Musa rosea Baker, Ann. Bot. 7: 221. 1893. TYPE: [India, Calcutta, Botanical Garden, June 1882], Herb. Hort. Calcuttensis, s. coll. (lectotype, designated here, CAL 469271).

Musa angcorensis Gagnepain, Bull. Soc. Bot., France 54: 412. 1907. Syn. nov. TYPE: [Vietnam] Me-Kong expedition in 1866–1868, *Thorel 2082* (lectotype, designated here, P).

The lectotype specimen for *Musa rosea* is quite old, and the label is distorted to the point that the date of collection as well as the name of the collector could not be read except for the words "Herb Hort Calcuttensis." In his description, Baker (1893) referred to two specimens in the Calcutta herbarium and stated that the samples had been taken from the Botanical Garden in June 1882. In Kew there is a letter from W. Watson dated 10 July 1890, addressed to J. G. Baker, with two sketches of *M. rosea* made in Hort. Bot. Calcutta and dated June 1892. It is likely that these were drawn for Baker from a herbarium sample.

Musa angcorensis

The lectotype collection of *Musa angcorensis* (Fig. 3) consists of three sheets at Paris and agrees with *M. rosea* Baker, with *M. angcorensis* being a new

synonym. The taxonomy of *M. angcorensis* has been confused (Gagnepain, 1907). It has tentatively been referred to *Callimusa* Cheesman (Cheesman, 1947; Simmonds, 1960; Champion, 1967).

Gagnepain (1907: 412) wrote:

"This species looks close to *M. rubra* which one finds not far from there in Siam. It differs: (1) in the leaves not being truncated at the base, but rather lengthily decurrent on the petiole, (2) in the nodes not being pressed at maturity, (3) in the bracts which are pale red rather than dark red, (4) in the internal piece of the perianth which is not only twice as short than the other one, but 4 times shorter, and not lanceolate but oval-obtuse." (Translated from the French.)

Chevalier (1934: 516–517) further comments (after *Musa coccinea*) that:

"A second species recently described in the *Flore d'Indochine* is the *M. angcorensis* Gagnep. with an equally erect inflorescence. It differs from the previous species in the linear bracts and the pubescent peduncle. It is known only from the site of the Angkor ruins in Cambodia. The two species belong to the *Musa* section *Rhodochlamys*." (Translated from the French.)

François Gagnepain earlier described *Musa angcorensis* (1907: 412):

"Robust herb of nearly 2 m. Rhizome rounded, but flattened from above. Stem of 50–60 cm. Leaves 6–8, lanceolate, pointed, reduced at both extremities and non-hairy on both sides. Leaves split along the secondary nerves, length 40–60 cm by 20 cm. Petiole of 20–30 cm, robust, with a canal, not hairy. Inflorescence length 20–30 cm, terminal, erect, not higher than the leaves, peduncle hairy, and the size of a finger, bracts in a spiral, erect, concave, sessile, pale red in color, very smooth. Basal flowers female, apical flowers male, around three under each bract. Perianth in two pieces—very unequal. The large part concave, smooth, tooth-edged, length 4 cm, 4 toothed and obtuse triangular in shape. The small part, oval, concave, rounded at the tip, 1/4 the size of the large part—10–11 mm. 5 stamens, equally the same size, small and aborted in the female. Filament threadlike, anther straight, linear-lanceolate, length 14 mm. Ovary smooth, three sided, nearly cylindrical, 3 locules, length 10 mm in the flower. Ovules numerous, biseriate, style threadlike, absent in male flower. Stigma smooth, small at opening." (Translated from the French.)

In *Musa angcorensis* and *M. rosea*, the perianths are divided into two pieces, namely the compound and free tepals.

Conclusion

Taking into consideration all of the facts, there is no doubt that *Musa rosea* and *M. angcorensis* are synonymous. *Musa rosea* has naming priority (Greuter et al., 2000; cf. Art. 11.5). It is also notable that *M. rosea* is now introduced into cultivation in very limited areas in Peninsular Malaysia (M. Häkkinen, pers. obs.). It is totally missing from Thailand, for example, where ornamental bananas are quite commonly cultivated. It seems clear that *M. rosea* originated in the Cambodia–South Vietnam lowland areas, from which its natural populations have either partially or mostly disappeared due to human influence.

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Literature Cited

Baker, J. G. 1893. A synopsis of the genera and species of Museae. Ann. Bot. (Oxford) 7: 189–229.

Champion, J. 1967. Les Bananiers et Leur Culture. IFAC, Editions SETCO, Paris.

Cheesman, E. E. 1931. A note on *Musa ornata*. Kew Bull. XLIV: 297–299.

———. 1947. Classification of the bananas. II. The genus *Musa* L. Kew Bull. No. 2: 106–117.

———. 1949. Classification of the bananas. III. Critical notes on species. Kew Bull. No. 1: 24–28.

Chevalier, A. 1934. Observations sur quelques bananiers sauvages et cultivés. Bananiers spontanés de l'Indochine. Rev. Bot. Appl. Agric. Trop. 14: 506–521.

De Wildeman, M. E. 1912. Les Bananiers. Ann. Mus. Colon. Marseille, Ser. 2. 10: 353.

Edwards, S. T. 1823. *Musa rosacea*. Edwards's Bot. Reg. 9: table 706 A, B.

Fawcett, W. 1913. The Banana. Its Cultivation, Distribution and Commercial Uses, 1st ed. Duckworth, London.

Gagnepain, F. 1907. Musacées. Bull. Soc. Bot. Fr. 54(4): 412.

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Häkkinen, M. 2003. Taxonomic history and identity of *Musa rubra* Wall. ex Kurz. Philipp. Agric. Sci. 86(1): 92–98.

——— & S. Sharrock. 2002. Diversity in the genus *Musa*—Focus on *Rodochlamys*. Pp. 16–23 *in* INIBAP Annual Report 2001. Montpellier, France.

Jacquin von, N. J. 1804. *Musa rosacea*. Hort. Schoenbr. 4: Table 445.

Kurz, S. 1856–1866. Note on the plantains of the Indian archipelago. J. Agric. Soc. Ind. 14: 301.

Lestiboudois, T. 1841. Observations sur les Musacées, les Scitaminées, les Cannées et les Orchidées. Mem. Soc. Roy. Sci. Lille, p. 16, plate 13.

———. 1842. Sur les Musacées. Ann. Sci. Nat. (Paris), Ser. II, xvii, table 12, figs. 11–15.

Linnaeus, C. 1753. *Musa* L. Pp. 1043 *in* Species Plantarum, Vol. 2. Impensis Laurentii Salvii, Stockholm.

Roxburgh, W. 1824. Flora Indica, Vol. 2. Mission Press, Serampore.

Schnizlein, A. 1849. Musaceae. *In* Iconographia Familiarum Naturalium Regni Vegetabilis, Vol. 1, t. 70. Max Cohen & Sohn, Bonn.

Simmonds, N. W. 1960. A check-list of *Musa*. Kew Bull. 14(2): 204.

Stapf, O. 1929–1931. Pp. 333–336 *in* Index Londinensis to Illustrations of Flowering Plants, Ferns and Fern Allies. Clarendon Press, Oxford.

A New Species of *Bulbophyllum* (Orchidaceae) from Yunnan, China

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Abstract. *Bulbophyllum dulongjiangense* X. H. Jin, a new species from Yunnan, China, is described and illustrated. The new species is related to *B. gyrochilum* Seidenfaden but differs from it by having larger flowers, longer lateral sepals to 2.3 cm with the dorsal sepal to 1.4 cm, falcate column stelids to 1.5 mm, and lip with two dorsal ridges.

Key words: *Bulbophyllum*, China, Orchidaceae, sect. *Desmosanthes*, Yunnan.

Bulbophyllum Thouars is an orchid genus comprising about 1000 species widely extending from tropical America, Africa, Madagascar, and mainland Asia to Australasia. There are about 100 species in China and about 65 in Yunnan (Tsi, 1999; Li, 2003). During fieldwork along the Dulong River in northwest Yunnan, a new species of *Bulbophyllum* was found.

Bulbophyllum dulongjiangense X. H. Jin, sp. nov. TYPE: China. Yunnan: Gongshan Co., Dulongjiang, Dandanlika Mts., 4 Nov. 2004, *X. H. Jin 6479* (holotype, KUN; isotype, PE). Figure 1.

Haec species habitu *Bulbophyllo gyrochilo* Seidenfaden subsimilis, sed floribus majoribus, sepalis longioribus, sepalo dorsali multo breviore quam sepalis lateralibus, stelidiis longioribus et falcatis, labio cristis extensis ab basi ad apicem differt.

Epiphytic on tree; rhizome pendent and free-hanging with roots at its base; roots terete, arising from nodes of pseudobulbs and rhizomes, running along rhizome; pseudobulbs cylindrical, spaced closely along the rhizome, adpressed, pointing toward the apex of the rhizome at an acute angle to the rhizome, 1.5–2 cm, 0.5–0.8 cm diam. Leaf 1 of each pseudobulb, lanceolate 3.5 × 0.9–1 cm, acute, slightly oblique. Inflorescences arising from pseudobulb base, sub-umbelliform, 0.8 cm, shorter than pseudobulbs, 10- to 15-flowered, with 2 to 3 membranous infertile bracts, 5 mm; fertile bracts lanceolate, 0.7–0.8 mm. Ovary with pedicel 0.5–0.6 cm; flowers pale yellow, patent; dorsal sepal linear, caudate, 1.2–1.4 × 0.1 cm; lateral sepals linear, oblique at base, caudate, 2.1–2.3 × 0.2 cm; petals oblong, acuminate, 1-veined, 1.9–2.1 × 1.3–1.5 mm; lip yellow, oblong, fleshy, pubescent at margin, 2 dorsal ridges ranging from base to tip, 2–2.2 × 0.9–1 mm; column stout, winged, 1–1.1 mm; column stelids falcate, 1.5 mm; column foot 1 mm; pollinia 2; anther cap entire, dorsal ridged. Fruits not seen.

Distribution and phenology. This new species is epiphytic on branches and tree trunks on the eastern slope of the Dandanlika Mountains. Up to now, only one population of about 150 clusters has been found. Flowering October to November.

Bulbophyllum dulongjiangense is closely related to *B. gyrochilum* from Doi Sutep and Chong Tha, Thailand. Both have pendent, free-hanging rhizomes, roots extending along the rhizomes, and short-scaped sub-umbellate inflorescences. However, they can be readily distinguished by their flower size, length of sepals, and callus on lip. *Bulbophyllum dulongjiangense* has larger flowers, dorsal sepal to 1.4 cm, lateral sepals to 2.3 cm, and lip with two dorsal ridges, whereas *B. gyrochilum* has smaller flowers, sepals of equal length or the lateral sepals slightly longer (about 4–5 mm), and the lip is only somewhat papillose.

Seidenfaden (1979) stated that it was difficult to arrange a natural sectional system for *Bulbophyllum gyrochilum*; this is also true of its allied species, *B. dulongjiangense*. The new species has a pendent, free-hanging rhizome and roots extending along the rhizome from the nodes of the pseudobulb and the rhizome. This habit is similar to that of plants in *Bulbophyllum* sect. *Polyblepharon* Schlechter. At the same time, its sub-umbellate inflorescences and caudate sepals are reminiscent of those of the plants in *Bulbophyllum* sect. *Cirrhopetalum* (Lindley) P. Royen. Despite this, we assign the new species to *Bulbophyllum* sect. *Desmosanthes* (Blume) J. J. Smith based on its sub-umbellate and many-flowered inflorescences and free lateral sepals.

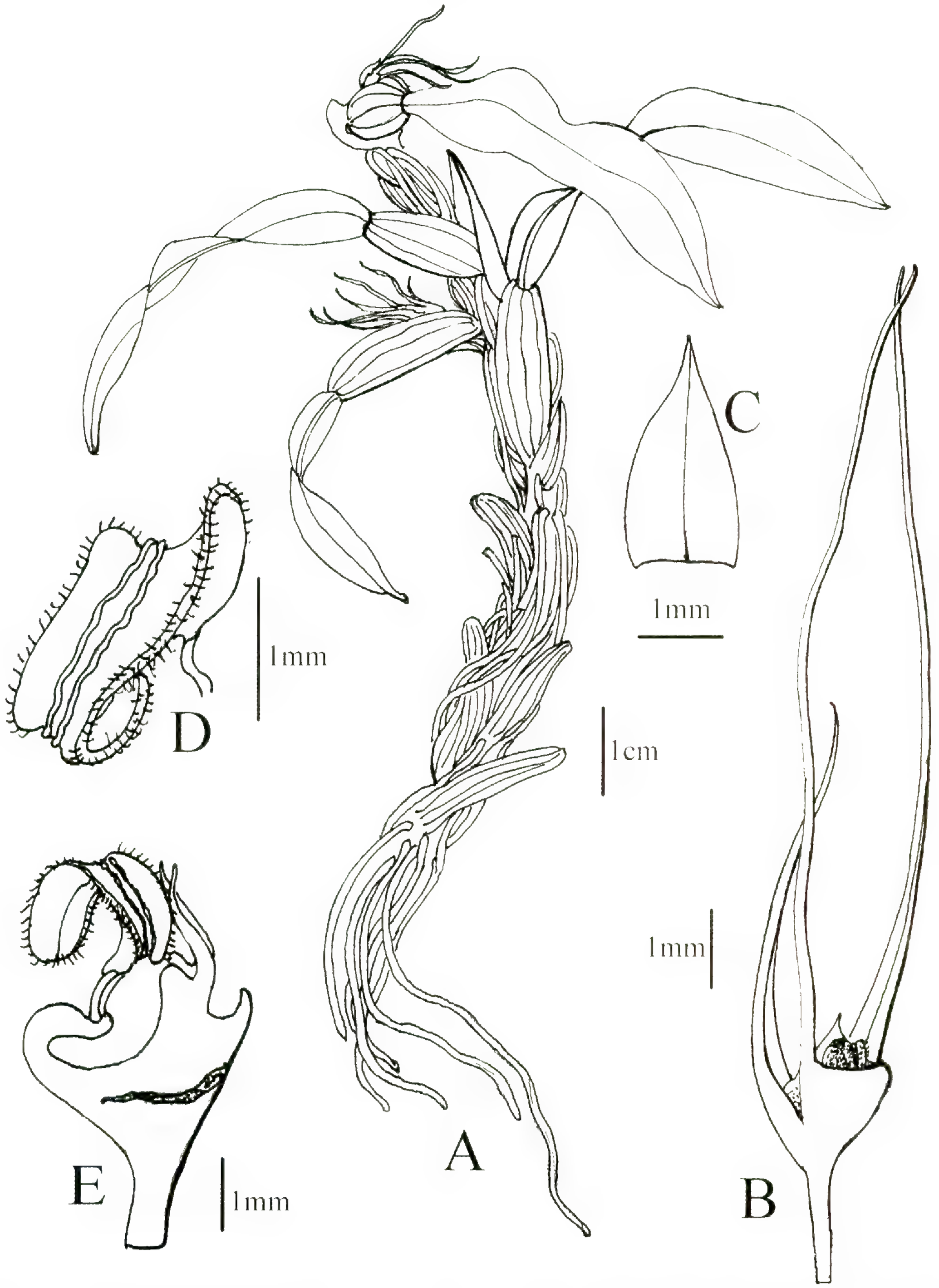

Figure 1. *Bulbophyllum dulongjiangense* X. H. Jin. —A. Habit. —B. Lateral view of flower. —C. Petal. —D. Decurved lip. —E. Lateral view of column and lip. Drawn from the holotype *Jin 6179*, KUN.

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Literature Cited

Li, H. 2003. *Bulbophyllum*. Pp. 666–714 *in* H. Li (editor), Flora Yunnanica. Vol. 14. Science Press, Beijing.

Seidenfaden, G. 1979. Orchid genera in Thailand *Bulbophyllum* Thou. Dansk Bot. Ark. 33(3): 80–82.

Tsi, Z. H. 1999. *Bulbophyllum*. Pp. 164–257 *in* Z. H. Tsi (editor), Flora Reipublicae Popularis Sinicae. Vol. 19. Science Press, Beijing.

Novitates Gabonensis 59: *Combretum wilksii* (Combretaceae), a New Species from Gabon

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Abstract. The new species *Combretum wilksii* Jongkind from Gabon is described. The species belongs to *Combretum* Loefling sect. *Combretum*. The combination of the almost flat upper receptacle, the subcircular, glabrous petals ca. 2 mm long, and the glabrous disk distinguishes this species from all other *Combretum* species in Africa and, more particularly, from related Gabonese species such as *C. scandens* Liben, *C. polyanthum* Jongkind, and *C. demeusii* De Wildeman.

Key words: Combretaceae, *Combretum*, Gabon, taxonomy.

Just after the publication of the Combretaceae part of the *Flore du Gabon* (Jongkind, 1999), a new *Combretum* Loefling specimen in flower was sent to the herbarium in Wageningen. This specimen was collected by Chris Wilks in East Gabon and sent first to the Missouri Botanical Garden herbarium by Gordon McPherson. With the *Flore du Gabon* already published, it was not difficult to recognize it as a new undescribed species. Recently this species was included in the *Checklist of Gabonese Vascular Plants* using a provisional name. The author wants to validate the name in this publication because publishing a new taxon in a checklist should be avoided, sensu Rec. 30A.2 (Greuter et al., 2000: 52). With this species, there are now 16 different species of *Combretum* lianas known from Gabon (Jongkind, 2006).

Combretum wilksii Jongkind, sp. nov. TYPE: Gabon. Haut-Ogooué: E of Okondja, near village of Ambinda, along Sébé River, 27 Sep. 1996, *Wilks* in *McPherson 16732* (holotype, WAG; isotypes, LBV, MO).

Section *Combretum*. Liana magna: flores tetrameri: receptaculum superius patelliforme: petala rotundata, glabra et discus glabrus.

Large liana. Leaves opposite: petiole up to 1 cm: blade up to 18 × 9 cm, almost glabrous; 6 to 9 pairs of main secondary nerves, domatia inconspicuous, tertiary nervation parallel to each other and just visible; base rounded to narrowly cordate; apex shortly acuminate. Scales ca. 40 µm diam. Inflorescence paniculate, up to 10 cm, branches covered with scales and small unbranched hairs, bracts inconspicuous. Flowers 4-merous, sessile; receptacle covered with scattered scales and few hairs; lower receptacle 2 mm high; upper receptacle patelliform, 4 mm wide; calyx lobes shortly triangular, pubescent inside; petals ca. 2 × 2 mm, glabrous, yellowish; stamens ca. 1.5 mm, anthers 0.5 mm; disk lobed, 2.5 mm diam., glabrous, style ca. 1.5 mm. Fruit not known.

Habitat and distribution. Only known from the forest at the type locality in Gabon.

The combination of the almost flat upper receptacle, the subcircular, glabrous petals ca. 2 mm long, and the glabrous disk distinguishes this species from all other *Combretum* species in Africa and, more particularly, from related Gabonese species such as *C. scandens* Liben, *C. polyanthum* Jongkind, and *C. demeusii* De Wildeman.

In the key to the *Combretum* species in the *Flore du Gabon* (Jongkind, 1999: 9), the following couplet should be inserted between couplets 21 and 22. From 21′ one should go to the new couplet:

a. Petals almost round, ca. 2 mm diam. Disk ca. 2.5 mm, glabrous, lobed . . . . . *Combretum wilksii*
b. Petals clearly longer than wide or disk smaller than 2 mm and pubescent on the margin . . . . . [follow existing key]

Literature Cited

Greuter, W., J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, T. S. Filgueiras, D. H. Nicolson, P. C. Silva, J. E. Skog, P. Trehane, N. J. Turland & D. L. Hawksworth (editors). 2000. International Code of Botanical Nomenclature (Saint Louis Code). Regnum Veg. 138.

Jongkind, C. C. H. 1999. Combretaceae. *In* Flore du Gabon, Part 35. Muséum National d'Histoire Naturelle, Paris.

———. 2006. Combretaceae. Pp. 110–113 *in* M. S. M. Sosef, J. J. Wieringa & C. C. H. Jongkind et al., Checklist of Gabonese Vascular Plants. Scripta Botanica Belgica, Vol. 35. Le Jardin Botanique de Belgique, Meise.

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Myrcia inconspicua (Myrtaceae), a New Species from Espírito Santo, Brazil

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Abstract. *Myrcia inconspicua* L. Kollmann & Sobral, a new species from montane forests of the Brazilian state of Espírito Santo, is described and illustrated. The species is characterized by solitary, axillary flowers, an uncommon feature in the genus, and by its shrubby habit and dense red-brown indument of branches and leaves. It is tentatively related to *Myrcia anomala* Cambessèdes, a subshrub from southern and central Brazil that occasionally bears solitary flowers.

Resumo. *Myrcia inconspicua* L. Kollmann & Sobral, uma nova espécie das florestas montanas do estado do Espírito Santo, Brasil, é descrita e ilustrada. A espécie se caracteriza pelo hábito arbustivo, pelo denso indumento rufescente dos ramos e folhas e pelas flores solitárias e axilares, uma característica incomum no gênero. *Myrcia inconspicua* é tentativamente relacionada com *Myrcia anomala* Cambessèdes, subarbusto do centro e sul do Brasil que ocasionalmente apresenta flores solitárias.

Key words: Brazil, Espírito Santo, IUCN Conservation Status, *Myrcia*, Myrtaceae.

Myrcia DC. ex Guillaumin is an American genus of subtribe Myrciinae O. Berg with some 400 species (Landrum & Kawasaki, 1997) characterized by mostly paniculiform inflorescences, pentamerous flowers with bilocular ovaries bearing two ovules per locule, and embryos with two well-developed cotyledons and an evident hypocotyl (McVaugh, 1968; Landrum & Kawasaki, 1997).

During a study of the Myrtaceae in the municipality of Santa Teresa, in the coastal montane region of the Brazilian state of Espírito Santo, a curious species of *Myrcia* with solitary axillary flowers came to our attention; it is here described as new.

Myrcia inconspicua L. Kollmann & Sobral, sp. nov.

TYPE: Brazil. Espírito Santo: Santa Teresa, Penha, sítio de R. Pizziolo, 650 m, 1 Jan. 2004, *L. Kollmann 6349* (holotype, MBML; isotype, MO). Figures 1, 2.

Species haec a congeneris floribus axillaribus solitariis sessilis vel subsessilis recedit.

Shrub 0.8–3 m high; branches flexuous with leaves distichously attached; twigs to 1 mm diam., densely covered with red-brown erect trichomes 1.5–3 mm in young twigs. Blades oblong to elliptic-oblong, 4.8–7.2 × 1.5–2.5 cm, bullate, slightly discolorous, the young ones adaxially with scattered reddish spots visible even in dried material, glabrous adaxially and with erect rufous trichomes to 2 mm abaxially, these especially dense along the midvein; apex acute or occasionally obtuse; base cordate or obtuse; midvein sulcate adaxially and salient abaxially; secondary veins in 8 to 10 pairs, scarcely visible and sometimes slightly sulcate adaxially, raised abaxially; marginal vein somewhat discontinuous, formed by the arches of the secondary veins, 1–1.8 mm from the margin, the margin itself markedly ciliate at least in young leaves, the cilia to 2 mm; petioles 1–3.5 × 0.8–1 mm, with trichomes to 2 mm, sometimes concealed by the leaf bases when observed from above. Flowers solitary, axillary, set below the leaves and concealed when the branch is viewed from above; pedicels absent or to 1 × 1 mm; bracteoles persisting after anthesis, lanceolate to linear, 7–10 × 1–1.2 mm, slightly keeled, with trichomes 0.5–1 mm, more dense along the keel; flower buds not seen; calyx lobes 5, triangular-lanceolate, 3–4.5 × 1.5–2 mm, erect at anthesis and slightly unequal, glabrous adaxially and with erect red-brown trichomes to 1 mm abaxially; petals white, rounded to obovate, 3–5 × 3–4 mm, glabrous or with scattered trichomes to 0.2 mm; stamens 70 to 80, 3–5 mm, the anthers subquadrate or trapezoidal, 0.4 × 0.3–0.4 mm, with no evident gland in the examined flowers; staminal ring rounded, about 2 mm diam., with scarce red-brown trichomes

Figure 1. *Myrcia inconspicua* L. Kollman & Sobral. From the holotype, *Kollmann 6319* (MBML).

0.1–0.2 mm; calyx tube present, to 0.5 mm deep; style 5 mm, the stigma punctiform and minutely papillose; ovary 2-locular, with 2 ovules per locule. Fruits immature, globose to globose-ellipsoid, to 6–7 × 5 mm, with trichomes 1–1.5 mm; seed 1 per fruit, reniform, 5 × 4 mm; embryo with 2 folded cotyledons 7–8 × 4 mm, surrounded by a coiled hypocotyl to 8 × 1 mm.

Affinities. Most *Myrcia* have flowers along a well-developed paniculiform or racemiform axis. Although species with three flowers along a developed axis are not rare, few species are known where axes are drastically reduced and only a single flower is present, such as *Myrcia anomala* Cambessèdes (Cambessèdes, 1832–1833; Legrand & Klein, 1969), *M. sessiliflora* McVaugh (McVaugh, 1969), and *M. gentryi* B. Holst

Figure 2. *Myrcia inconspicua* L. Kollman & Sobral. Flowers photographed from the abaxial side of the branch (*Kollmann 6349*, MBML: photograph by L. Kollmann). Scale bar = 10 mm.

(Holst, 2004). Nevertheless, in these species this condition is apparently occasional and due to a local reduction of the inflorescence axis, while other parts of the branch bear flowers on a more developed axis, as is the case even in *M. gentryi*, where some inflorescences bear more than one flower (Holst, 2004: 5). In *M. inconspicua*, however, inflorescences are consistently reduced to only one sessile or subsessile flower without an evident axis, a quite unusual feature in the genus. In the exsiccatae we have examined, we could not find any vestigial bud or bract scar that would indicate abortion of an axis. During a survey of the inflorescence structure of *Myrcia*, we have found two South American species with names suggestive of solitary flowers, *Myrcia uniflora* Barbosa Rodrigues ex Chodat & Hassler and *M. monantha* Barbosa Rodrigues ex Chodat & Hassler (Chodat & Hassler, 1907). Both species indeed belong to *Eugenia* L., respectively to *E. punicifolia* (Kunth) DC. and *E. plurisepala* Barbosa Rodrigues ex Chodat

& Hassler, and their inclusion in *Myrcia* by Barbosa Rodrigues was evidently a mistake. We have also considered the possibility that such a distinct plant as *M. inconspicua* could belong to *Myrceugenia* O. Berg rather than *Myrcia*. *Myrceugenia* is the only genus with myrcioid affinities with species that bear consistently solitary flowers (Landrum, 1981). Nevertheless, flowers in *Myrceugenia* are always 4-merous and devoid of calyx tubes, and locules are largely multiovulate (although individuals of some species occasionally present two ovules per locule) (Landrum, 1981).

Myrcia inconspicua is tentatively related to the central and southern Brazilian *Myrcia anomala*, with which it shares lanceolate bracteoles and calyx lobes and in which flowers occasionally appear solitary. The following key couplet states the differences between them:

1a. Subshrubs to 0.5 m; branches glabrous or with gray trichomes less than 1 mm long; blades markedly reticulate-veined; apex mucronate to 1 mm; bracteoles deciduous at anthesis; flowers occasionally solitary in some leaf axils (but inflorescences with a more or less developed axis also present); cerrados and open fields of southern and central Brazil . . . . . *Myrcia anomala*

1b. Subshrubs to shrubs 0.8–3 m tall; branches densely covered with red-brown trichomes 1.5–3 mm; blades not visibly reticulate-veined; apex widely acute or obtuse, not mucronate; bracteoles persisting after anthesis; flowers solitary in leaf axils; coastal montane forests from eastern Brazil . . . . . *Myrcia inconspicua*

Habitat, distribution, and phenology. *Myrcia inconspicua* is a shrub from shaded, montane forests (Atlantic forest) from the central montane zone of Espírito Santo, at altitudes between 650 and 850 m above sea level. It occurs in relatively undisturbed forests and has a marked preference for more densely shaded portions of the forests. Its distribution is patchy, with several individuals growing together and with long distances between groups (we have observed about 20 to 30 individuals in each group). Currently, the species is known only from two municipalities, Santa Maria de Jetibá and Santa Teresa. Flowers were collected in January and fruits from January to March.

Conservation. The municipalities of Santa Maria de Jetibá and Santa Teresa are located in central Espírito Santo, occupying an area of approximately 1500 km^2. The central region of Espírito Santo has been intensely deforested during the 20th century for farming, agriculture, and timber trade, and most municipalities have very small areas with original vegetation. Data from Santa Teresa (Mendes & Padovan, 2000: 16) report only 18% of the municipality area as still bearing original vegetation. Although we did not find recent data for the municipality of Santa Maria de Jetibá, its economy and land use are similar. According to the IUCN criteria for threatened species (IUCN, 2001), *Myrcia inconspicua* could be considered at least an endangered species (EN), because it fits criteria B2 (area of occupancy estimated to be less than 500 km^2—as is the case due to its patchiness), B2a (habitat severely fragmented), and B2b(iii) (continuing decline observed in area, extent, and quality of habitat—as is the case since forest removal has not ceased in central Espírito Santo).

Etymology. The epithet is from the Latin word for "unnoticeable" and alludes to the unusual orientation of the flowers, which are obscured beneath the leaves, as well as to the habit, since its small height and tiny, flexuous branches cause it to be scarcely noticeable in its habitat.

Paratypes. BRAZIL. **Espírito Santo:** Santa Maria de Jetibá, *L. Kollmann & M. V. S. Berger 5981* (BHCB, MBML); idem, *H. Q. Boudet Fernandes, A. M. Assis, V. Demuner, E. Bausen, R. Verdoet & J. Bremenkamp 3293* (MBM, MBML); Santa Teresa, *L. Kollmann & M. Sobral 6574, 6575, 6577, 6578, 6583* (all MBML); idem, Penha, sítio de R. Pizziolo, *L. Kollmann & R. Kollmann 7288* (MBML).

Literature Cited

Cambessèdes, J. 1832–1833. Myrtaceae. Pp. 277–381 *in* A. Saint-Hilaire (editor), Flora Brasiliae Meridionalis 2.

Chodat, R. & E. Hassler. 1907. Plantae Hasslerianae—Myrtaceae. Bull. Herb. Boissier 2 série 7: 795–808.

Holst, B. 2004. A new species of *Myrcia* (Myrtaceae) from Cerro Huachamacari, Venezuela. Biollania 10: 4–6.

IUCN. 2001. IUCN Categories and Criteria Version 3.1. IUCN Species Survival Commission, Gland, Switzerland.

Landrum, L. R. 1981. A monograph of the genus *Myrceugenia* (Myrtaceae). Flora Neotropica 49: 1–137.

——— & M. L. Kawasaki. 1997. The genera of Myrtaceae in Brazil: An illustrated synoptic treatment and identification keys. Brittonia 49: 508–536.

Legrand, C. D. & R. M. Klein. 1969. Mirtáceas Myrcia. Pp. 217–330 *in* R. Reitz (editor), Flora Ilustrada Catarinense, Itajaí.

McVaugh, R. 1968. The genera of American Myrtaceae—An interim report. Taxon 17: 354–418.

———. 1969. Flora of the Guayana Highland—Myrtaceae. Mem. New York Bot. Gard. 18: 55–286.

Mendes, S. L. & M. P. Padovan. 2000. A Estação Biológica de Santa Lúcia, Santa Teresa, Espírito Santo. Bol. Mus. Biol. Mello Leitão (nova série) 11/12: 7–34.

Croton mayanus (Section *Eluteria*: Euphorbiaceae), a New Species Endemic to the Yucatán Peninsula, Mexico

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Abstract. A new species belonging to *Croton* L. sect. *Eluteria* Grisebach (Euphorbiaceae) is described from, and endemic to, the Yucatán Peninsula, Mexico. The species is named *C. mayanus* B. L. León & Vester after the Mayan zone where it is mainly found. It is distinguished from *C. niveus* Jacquin, *C. reflexifolius* Kunth, and *C. pseudoniveus* Lundell, the species that it most closely resembles, by its combination of lepidote hairs on the fruit, smooth fruit surface, leaves glabrescent abaxially, and fruiting pedicels 8–13 mm long.

Key words: Calakmul, *Croton*, *Eluteria*, Euphorbiaceae, Yucatán Peninsula.

The genus *Croton* L. belongs to the Euphorbiaceae s. str., one of the most abundant and diverse angiosperm families, with an estimated 6300 species (Wurdack et al., 2005). In the same sense the genus *Croton* is widespread, with 1223 accepted species (Berry et al., 2005), the majority of which are Neotropical (Webster, 1994). Euphorbiaceae s.l. was divided into 40 sections (Webster, 1993). The section *Eluteria* Grisebach is principally distributed in Mesoamerica and the Antilles. It is distinctive within *Croton* for its axillary or pseudoaxillary inflorescences that are often combined with terminal inflorescences, the absence of glands at the base of the lamina, pistillate flowers with petals, and a lepidote indumentum (Webster, 1993). Based on morphological features and geographical distribution, *Croton* sect. *Eluteria* seems to be monophyletic (Paul Berry, pers. comm., 2004), with 12 species validly described (Webster, 1993).

The new species clearly belongs to section *Eluteria*, because it has pseudoaxillary inflorescences (only with small leaves at the base), leaves without glands, pistillate flowers with petals, and lepidote indumentum. It was encountered during fieldwork for an architectural study of *Croton* sect. *Eluteria* on the Yucatán Peninsula, Mexico. The first collections seen by the authors, paratypes from 20 years ago (listed below) were previously determined as *C. niveus* Jacquin, from which it is clearly distinguished by its lepidote hairs on the fruit and glabrescent abaxial leaf. We collected *C. mayanus* B. L. León & Vester in the Mayan zone, Quintana Roo (*H. Vester & B. L. León 1360, 1361, 1362*) in April 2003. One of the specimens (*H. Vester & B. L. León 1361*) presented nearly ripe fruits and staminate flower buds. Leaves were just budding on leafless branches, indicating the species is deciduous, a characteristic that we were also able to see in other *Croton* species (*C. niveus* and *C. fantzianus* F. Seymour, and rarely in *C. arboreus* Millspaugh) of section *Eluteria*. Later, the species was also collected in the more southern neighborhood of the Calakmul Reserve (*B. L. León & H. Vester 108, 109, 110, 113, 114*). All known specimens of this species were collected on the Yucatán Peninsula, which suggests it is endemic there.

Croton mayanus B. L. León & Vester, sp. nov. TYPE: Mexico. Campeche: Mun. Calakmul, Camp. Ecol. "Yaax-che," at 6 km from the main rd. Xpujil–Escarcega toward the ruins of Calakmul, tropical deciduous forest, 216 m, 4 May 2004, *B. L. León & H. Vester 114* (holotype, CIQR; isotypes, CICY, CIQR, DAV, F, MEXU, MICH, MO, OAX, WIS). Figure 1.

Arbor monoica foliis deciduis, ad 10 m alta, sublepidota, stipulis obsoletis, petioli 1.5–3 cm longi. Folia 4.5–9 cm longa, 2.5–5.5 cm lata, lamina ovata, membranacea, subglabra, apice acuminata, basi rotundata, truncata vel subcordata, eglandulosa, margine integra. Racemi bisexuali. Flores masculi pedicello 2 mm longo, sepala 5, petala 5; stamina 10–12(17). Flores feminei pedicello 3–3.5 mm, sepala 5, petala 5; ovarium lepidotum, stylo 3-partito, partibus bifurcatis, laciniatis. Capsula prolata, lepidota, pedicello 13 mm longo. Species foliis infra subglabris, capsula lepidota et pedicello fructuum ad 13 mm longo a congeneris sectionis *Eluteriae* diversa.

Deciduous tree, to 10 m in height, foliage, fruits, and branches with indumentum lepidote, with subentire scales, 0.2 mm diam. (Fig. 1G); external bark with fine fissures, nearly smooth, clear khaki in color; internal bark pink with a ± repugnant smell of resin, and yellow exudate. Leaves ovate, 4.5–9 × 2.5–5.5 cm, alternate (Fig. 1D), entire, apex acuminate, base rounded, truncate to subcordate, palmately veined (the 2 secondary basal veins more pronounced,

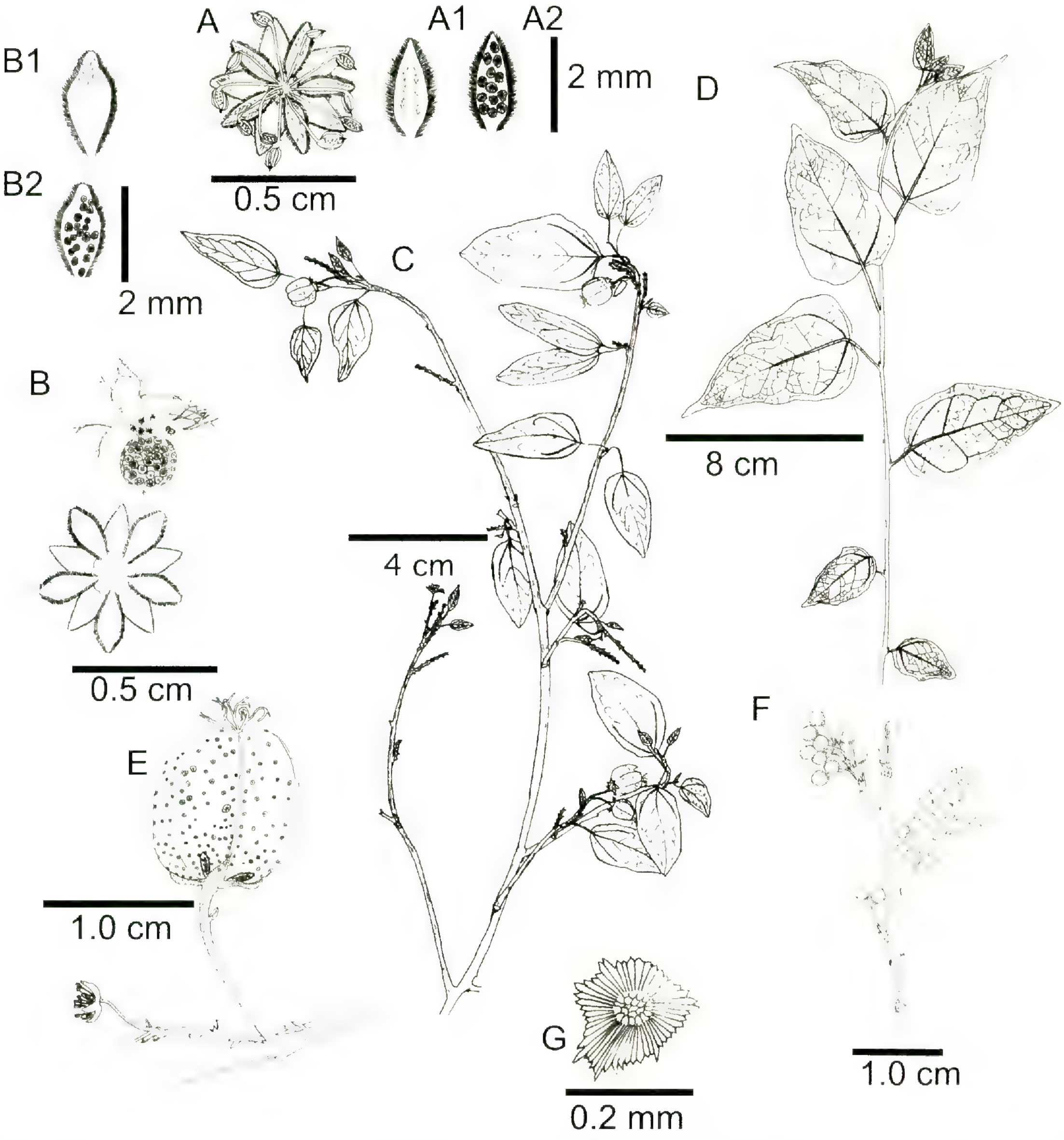

Figure 1. *Croton mayanus* B. L. León & Vester. —A. Staminate flower. —A1. Adaxial staminate petal. —A2. Abaxial staminate petal. —B. Pistillate flower with pistil removed. —B1. Adaxial pistillate petal. —B2. Abaxial pistillate petal. —C. Branch with fruits. —D. Shoot in summer, the veins more accentuated than in reality. —E. Ripe fruit on a mature inflorescence. —F. Inflorescence in spring when the plant has almost no leaves. —G. Scale from the fruit. Drawn from *H. Vester & B. L. León 1360, 1361* and *B. L. León & H. Vester 114* (CIQR).

as described by Webster, 2001), eglandular, glabrescent with age; stipules absent or rudimentary; petiole 1.5–3 cm. Inflorescences terminal or pseudoaxillary 1–2.5 × 0.8–1.3 cm (Fig. 1F), with 1 to 2 mature fruits per inflorescence, a raceme with staminate flowers above and pistillate flowers below or absent. Staminate flowers (Fig. 1A) with pedicels 2 mm, sepals 5, ovate, valvate, abaxially lepidote, 2.3 × 1 mm; petals 5, ovate, abaxially lepidote (Fig. 1A2), adaxially pubescent (Fig. 1A1), 2 × 0.9 mm; stamens 10 to 12(17), filaments inserted in a central disk, anthers 0.4 mm. Pistillate flowers (Fig. 1B) with ovary 3(to 4)-locular and 3-carpellate; pedicels 3–3.5 mm; sepals 5, entire, valvate, eglandular, ovate, 2.3 × 1.2 mm, abaxially lepidote, adaxially pubescent; petals 5, spatulate, elliptic, 2.3 × 1 mm, abaxially lepidote (Fig. 1B2), adaxially pubescent (Fig. 1B1); style exserted, trifurcate, then twice bifurcate, with stellate hairs at its base (Fig. 1B). Fruit (Fig. 1E) a capsule, smooth and lepidote, 9–10 × 8 mm; pedicel up to 13 mm; columnella persistent; seeds 6–7 × 4 mm with dark shiny testa, dorsally

flattened, with a small ventral ridge and carunculus directed to the center.

Habitat and distribution. *Croton mayanus* inhabits forests of Quintana Roo, Yucatán, and Campeche in Mexico from elevations of 10 to 250 m. The specimens in Quintana Roo were found in an ecosystem described by Durán (1986: 53) as "selva baja subcaducifolia con *Pseudophoenix sargentii* [H. Wendland in Sargent]," locally called "sak'alche," on shallow soils with severe water stress during the dry period (January to May), but water accumulating during the rainy season (June to November). The specimens in Campeche were found in a similar area with high drought stress.

Plant architecture. The architectural development corresponds to the Scarrone model (Hallé & Oldeman, 1970). Growth of the primary axis is orthotropic and rhythmic (Hallé et al., 1978), which is visible in the organization of the branches in groups along the axis. Inflorescences are terminal on the shoots, with some on long shoots, but most on short shoots axillary to the leaves (Fig. 1C) but distinguished from axillary inflorescences by the small leaves or leaf scars at the base.

Phenology. Flowering in February to March; fruiting April to June.

Common name. Perezcutz.

Relationships. Specimens of *Croton mayanus* seen at MEXU were previously determined as *C. niveus* or *C. reflexifolius* Kunth but did not fully agree with the description of either species. Fruits of *C. niveus* have a smooth surface with stellate indumentum and leaves with a silvery-lepidote surface abaxially. Fruits of *C. reflexifolius* have a clearly echinate surface with lepidote indumentum, and the leaves are silvery-lepidote abaxially. Fruits of *C. mayanus* have a smooth surface with lepidote indumentum (Fig. 1E), and the leaf is glabrescent abaxially.

Croton mayanus is similar to *C. pseudoniveus* Lundell, but the latter is distinct in its shorter pedicel of the fruit (2–6 mm vs. 8–13 mm), the scales at the fruit surface with a prominent center, giving it a semituberculate aspect, and the silvery-lepidote abaxial surface of the leaves.

Paratypes. MEXICO. **Campeche:** Mun. Calakmul, 1 km W of Plan de San Luis, rd. to Conhuas, Km 134, Hwy. Escarcega–Chetumal, *E. Lira 433* (MEXU); 1 km W of Km 19 on rd. to ruins of Calakmul, *E. Lira 1100* (MEXU); Mun. Calakmul, 1.5 km W of Plan de San Luis, on rd. to Conhuas, *E. Martínez 30835* (MEXU); Mun. Calakmul, rd. to ruins of Calakmul, 16 km from crossing w/Hwy. Chetumal–Escárcega, *B. L. León & H. Vester 108, 109, 110* (CICY, CIQR, DAV, F, MEXU, MO, MICH, OAX, WIS); Mun. Calakmul, rd. to ruins of Calakmul, 6 km from crossing w/Hwy. Chetumal–Escárcega, *B. L. León & H. Vester 113* (CIQR, DAV, MEXU, WIS). **Quintana Roo:** Mun. Carrillo Puerto, 4 km from Vigía Chico to Carrillo Puerto, *R. Durán & I. Olmsted 859* (MEXU); Mun. Solidaridad, footpath to Decovil, 200 m S of the crossing w/Hwy. Cancun–Tulum, W, *Moreno 508* (MEXU); Nat. Park Xel-Ha, *Marmolejo 1193* (MEXU); Mun. Felipe Carrillo Puerto, X-Hazil, footpath Pemex, *H. Vester & B. L. León 1360, 1361, 1362* (CIQR, DAV, WIS), *B. L. León 065, 066, 067* (MEXU, WIS); rd. Vigía Chico to Carrillo Puerto, 4 km before crossing w/rd. to Tres Reyes, *B. L. León & H. Vester 118* (CIQR, DAV, MEXU, MO, WIS). **Yucatán:** 6 km W of Timun, on rd. to Dzitas, *E. Cabrera & Cabrera 11250* (MEXU); Mun. Tecax, between Xul & Benito Juárez, *R. Darwin 2510* (CICY, MEXU).

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Literature Cited

Berry, P. E., A. L. Hipp, K. J. Wurdack, B. Van Ee & R. Riina. 2005. Molecular phylogenetics of the giant genus *Croton* and tribe Crotoneae (Euphorbiaceae sensu stricto) using ITS and *trn*L-*trn*F DNA secquence data. Amer. J. Bot. 92: 1520–1534.

Durán, R. 1986. Estudio de la vegetación de la selva baja subcaducifolia de *Pseudophoenix sargentii*. Bachelor's thesis, Universidad Nacional Autónoma de México, Mexico City.

Hallé, F. & R. A. A. Oldeman. 1970. Essai sur l'Architecture et la Dynamique de Croissance des Arbres Tropicaux. Monographies de Botanique et de Biologie Végétale, Vol. 6. Masson, Paris.

———, ——— & P. Tomlinson. 1978. Tropical Trees and Forest: An Architectural Analysis. Springer-Verlag, Berlin.

Webster, G. 1993. A provisional synopsis of the sections of the genus *Croton* (Euphorbiaceae). Taxon 42: 793–823.

———. 1994. Synopsis of the genera and suprageneric taxa of Euphorbiaceae. Ann. Missouri Bot. Gard. 81: 33–144.

———. 2001. Synopsis of *Croton* and *Phyllanthus* (Euphorbiaceae) in Western Tropical Mexico. Contr. Univ. Michigan Herb. 23: 353–388.

Wurdack, K. J., P. Hoffmann & M. W. Chase. 2005. Molecular phylogenetic analysis of uniovulate Euphorbiaceae (Euphorbiaceae sensu stricto) using plastid *rbc*L and *trn*L-F DNA sequences. Amer. J. Bot. 92: 1397–1420.

A New Subspecies of *Solanum scabrum* Miller Found in Uganda

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Abstract. *Solanum scabrum* Miller has been reported almost exclusively from cultivation as a vegetable for human consumption. However, molecular and morphological data indicate that a wild taxon exists in Uganda. This wild taxon was previously identified as the poisonous *S. nigrum* L., but local people use its leaves as food. This taxon is here described as a new subspecies, *S. scabrum* Miller subsp. *laevis* Olet. Morphological descriptions and a key to separate the two subspecies of *S. scabrum* are given.

Key words: Black nightshade, edible crop, garden huckleberry, IUCN Conservation Status, Solanaceae, *Solanum*, Uganda.

The section *Solanum* L., commonly known as black nightshades in the *S. nigrum* L. complex, is one of the largest and most variable species groups of the genus *Solanum* L. and consists of about 30 species, most of which originate from the New World tropics, particularly South America (Edmonds, 1972). Members of *Solanum* sect. *Solanum* were either lumped under *S. nigrum* or treated as numerous microspecies until the work of Edmonds and Chweya (1997), leading to a number of synonyms; the most well known ones for *S. scabrum* Miller are *S. guineense* (L.) Miller, *S. intrusum* J. Soria, *S. melanocerasum* Allioni, *S. nigrum* var. *guineense* L., *S. nigrum* subsp. *guineense* (L.) Persoon, and *S. tinctorium* Welwitsch. This has resulted in considerable confusion. The synonymy has been discussed by Heine (1960), Henderson (1974), and Edmonds (1979).

Solanum scabrum, commonly known as garden huckleberry, is by far the most commonly cultivated nightshade, and according to Berinyuy et al. (2002) it is probably the most important indigenous leafy vegetable in Africa, widely grown in the humid forest zone of Central and West Africa. It has also been cultivated in America and in southern Asia (Defelice, 2003). In southwest Uganda, *S. scabrum* is both a subsistence and a commercial crop. Typical plants are rare in Uganda, having been recorded from only the extreme southwestern part (Bukenya & Carasco, 1995). Literature reports *S. scabrum* almost exclusively from cultivation (Berinyuy et al., 2002; Bukenya & Carasco, 1995; Defelice, 2003). However, recent molecular studies (Olet et al., 2005) have shown that a wild form exists in Uganda. Botanists have previously identified this form as *S. nigrum*, a taxon well known for being highly poisonous, but the African plants so identified are used for human consumption in Africa. This enigma was addressed by Olet et al. (2005).

Amplified fragment length polymorphism (AFLP, Vos et al., 1995) is the marker of choice for studying intraspecific variation (Bensch & Åkesson, 2005; Weising et al., 2005). AFLPs have been used to pinpoint the domestication site for Einkorn wheat (Heun et al., 1997) and the potato (Spooner et al., 2005), as well as for the molecular taxonomy of *Vicia* L. (Wouw et al., 2001), *Vitis* L. (Fanizza et al., 2003), and *Solanum* (Lara-Cabrera & Spooner, 2004).

Our molecular study using AFLP marker analysis (Olet et al., 2005) showed that the Ugandan plants previously determined as *Solanum nigrum* are in fact *S. scabrum*, which consists of two taxa: the wild small-fruited and the cultivated large-fruited types, both used as vegetable. Typical *S. nigrum* is not used as food (Berinyuy et al., 2002), and it is now realized that this species possibly does not occur in tropical Africa (except as a casual). According to Defelice (2003), *S. nigrum* appears to be a primarily temperate plant with only a scattered presence in tropical areas. In a numeric taxonomic study of *S. scabrum* (Olet, 2004), we investigated ca. 40 live plants of subspecies *scabrum* Miller and ca. 30 live plants of subspecies *laevis* Olet. In addition, a number of herbarium sheets were considered but were not measured in detail.

Both the cultivated and wild taxa of *Solanum scabrum* are morphologically similar in their overall color, pubescence, and leaf and fruit characters. However, the wild taxon has a non-angular smooth stem, a more prominent geniculate style, and smaller leaf and fruit characters than the cultivated form. The

wild taxon of *S. scabrum* may be the original plant from which the large-fruited *S. scabrum* was selected, as that is a typical domestication trait. The development of the angular to almost winged spiny stem is more difficult to explain.

We propose that the two taxa of *Solanum scabrum* that are prominently different in morphology be given subspecific status, the cultivated taxon being *S. scabrum* subsp. *scabrum* and the wild taxon being *S. scabrum* subsp. *laevis*.

It is, of course, debatable whether one should use a formal category to distinguish a wild plant from its assumed derived cultivated taxon. In our opinion this must ultimately depend on the magnitude of the morphological differences and whether merging or differentiating the taxa will provide the most elucidating taxonomic treatment. In this case it is of paramount importance to have a separate name for the wild taxon; otherwise, botanists might continue to erroneously name the wild plant *Solanum nigrum*, as the plant is superficially more similar to this species than to cultivated *S. scabrum*. In any stage of development, the two subspecies are easily separated because of the non-angular stem in subspecies laevis.

A very similar case exists regarding the scarlet eggplant, *Solanum aethiopicum* L. Lester and Daunay (2004) describe four cultivar groups of this species, viz. *S. aethiopicum* Gilo Group, *S. aethiopicum* Shum Group, *S. aethiopicum* Kumba Group, and *S. aethiopicum* Aculeastrum Group. *Solanum anguivi* Lamarck is the wild ancestor of these cultivars, but no botanist has concluded that *S. anguivi* must be considered part of *S. aethiopicum* without formal distinction. In maize, *Zea mays* L. subsp. *mays*, the wild form (teosinte) is named *Z. mays* subsp. *parviglumis* Iltis & Doebley (Doebley, 2004), and although Beadle (1980) and Szabó and Burr (1996) demonstrated that the two differ in as few as five major gene changes only, to give the two exactly the same Latin name would bring only confusion to users. The same can be said for Einkorn, *Triticum monococcum* L. subsp. *monococcum*, where its wild form is named *T. monococcum* subsp. *boeoticum* (Boissier) C. Yen. As has been shown for maize (Matsuoka et al., 2002), the domesticated Einkorn wheat groups closely with those wild forms from where it is derived and less with the remaining wild forms, allowing the pinpointing of the domestication site (Heun et al., 1997). A similar result has been obtained with the potato (Spooner et al., 2005) and a variety of crop species such as coffee, tetraploid wheats, barley, and cotton.

KEY TO THE SUBSPECIES OF *SOLANUM SCABRUM* IN AFRICA

1a. Stems angled, winged, ridge teeth prominent; leaf apices obtuse to acute; inflorescence often branching, peduncle at right angles with branch, not ascending, flowers purple in Ugandan collections, white in the gene bank accessions, anthers brown, purplish brown, or yellow; mature fruits large, 10–15(16–17) mm broad, fruiting pedicel erect, fruit persistent . . . . . *S. scabrum* subsp. *scabrum*

1b. Stems terete, wings and ridge teeth absent; leaf apices acuminate to almost aristate; inflorescence without branching, peduncle at less than 90° with branch and ascending, flowers white, anthers yellow; mature fruits smaller, 8–10 mm broad, fruiting pedicel reflexed, fruit persistent or deciduous . . . . . *S. scabrum* subsp. *laevis*

1a. Solanum scabrum subsp. **scabrum** Miller, Gard. Dict., ed. 8. 1768. TYPE: U.S.A. Virginia. *P. Miller s.n.* (lectotype, BM).

Erect herb or subshrub ca. 0.7–1.2 m, with few branches spreading horizontally, moderately to densely pubescent with simple appressed eglandular hairs (pilose); stems purple or greenish purple, angled with prominent dentate wings. Leaves orbicular to broadly ovate, 10–14(16) × 6–13.5 cm; lamina purplish green or green with a purple tint; veins purple; leaf base cordate to truncate; leaf apex acute, subacute to obtuse, rarely cuspidate; leaf margin sinuate to entire or entire; petiole winged halfway up or not winged. Inflorescence umbellate to racemose or of extended cymes, sometimes branching once, 6- to 12(16)-flowered; peduncles at right angles with branch, 1.6–3(3.3) cm; pedicels reflexed or straight, 6–10 mm. Corolla stellate, purple with dark green to yellowish green base, 11–14(16) mm wide; style 3–4 mm, geniculate, rarely straight, exserted ca. 0.5–2 mm beyond anthers, rarely absent; calyx campanulate, rarely stellate; anthers brown, purplish brown, or yellow with deep purple tint and dark purple middle, (2)2.5–3 mm long. Ripe fruits deep purple to black with deep blue to purple pulp, or deep purple to black with dark blue pulp, 10–15(16–17) mm broad; fruit cuticle thick and opaque; mature sepal lobes ovate, mature calyx reflexed away from berry, strongly adherent, persistent; fruits persistent on plant when ripe; fruit pedicel erect or reflexed; seeds creamish green to brown, (1.7)1.8–2.1 mm; stone cells absent.

The type of the autonymic subspecies is taken from a plant cultivated in Chelsea Physics Garden in London (Miller, 1768). For more details on lectotypification see Henderson (1974) and Edmonds (1979).

Because this plant is so widely cultivated in the tropics of both hemispheres, it has previously been difficult to ascertain its origin (Edmonds & Chweya, 1997; Bukenya & Carasco, 1995). Today, it is probably most widely cultivated in West Africa (Berinyuy et al., 2002), while in Uganda it is rare and is cultivated only in Kigezi, in southwest Uganda.

Votes on the type. The type of *Solanum scabrum* at BM is nearly 250 years old, but it is in excellent condition with flowers and young fruits. The only important character that cannot be observed is the size of the mature berry. However, with its winged spiny stem, it is noticeably different from subspecies *laevis* described below.

Vernacular name. Nswiga ya Kizungu (Lukiga).

Collections from Uganda (DNA-tested). Western region: Kigezi, Kabale distr., Rubanda co., Kachwekano farm, 10 km SW of Kabale town, 2001, *E. A. Olet 48, 49 & 50* (MHU).

Collections from Uganda (not DNA-tested). Wes-Western region: Kigezi, Ruzhumbura, Bugangari, near habitation, Feb. 1949, *J. W. Purseglove 2712* (K); Kigezi D.F.T., open waste places near cultivated plots, 28 Aug. 1972, *P. M. Goode 3/72* (K).

1b. Solanum scabrum Miller subsp. **laevis** Olet, subsp. nov. TYPE: Uganda. U4, Buganda, Kampala district, Kawempe div., Kawempe North, Kalerwe, Tula rd., edge of barbed wire fence next to local road, 1220 m, 14 Feb. 2001, *E. A. Olet 88* (holotype, MHU; isotypes, K, MO). Figure 1.

Herba annua; caule laevi herbaceo; ramis teretibus. Foliis ovatis, non dentato-angulatis, glabris. Inflorescentia 4 ad 10 flora. Calyx 5-lobatus, in statu fructifero reflexus; corolla alba. Baccae fere 10 mm diam., globosae, nigrae; semina 1.5–2 mm longa.

Semi-decumbent spreading herb, about 0.7–1.2 m high, highly branched, subglabrous to glabrous, pilose; stems purple to greenish purple, terete and expanded at nodes. Leaves cordate, 6–13.4 × 3.3–7.3 cm; lamina dark green or dark green with purple patches; veins purple; leaf base truncate, rounded, subcuneate to cuneate; leaf apex acute to acuminate, sometimes aristate; leaf margin repand to entire; petiole winged halfway or not winged. Inflorescence lax cymes or lax usually extended cymes, (4)6- to 8(10)-flowered; peduncle at less than 90 with branch, ascending, 1.2–2 cm. Pedicels reflexed, 4.5–7(8) mm; mature calyx campanulate; corolla stellate, white with green to greenish yellow base, up to 12(13) mm wide; style (3.2)3.5–4.5(4.7) mm, prominently geniculate, exserted ca. 1.3–2 mm beyond anthers; anthers yellow to deep yellow, (2)2.3–3 mm. Ripe fruits deep purple to shiny black with greenish pulp, up to 10 mm broad; fruit cuticle of medium thickness and opaque; mature sepal lobes ovate, mature calyx reflexed away from berry, remains attached or not, fruits remaining or falling off from plant, fruit pedicel reflexed; seeds creamish green, 1.5–2 mm; stone cells absent.

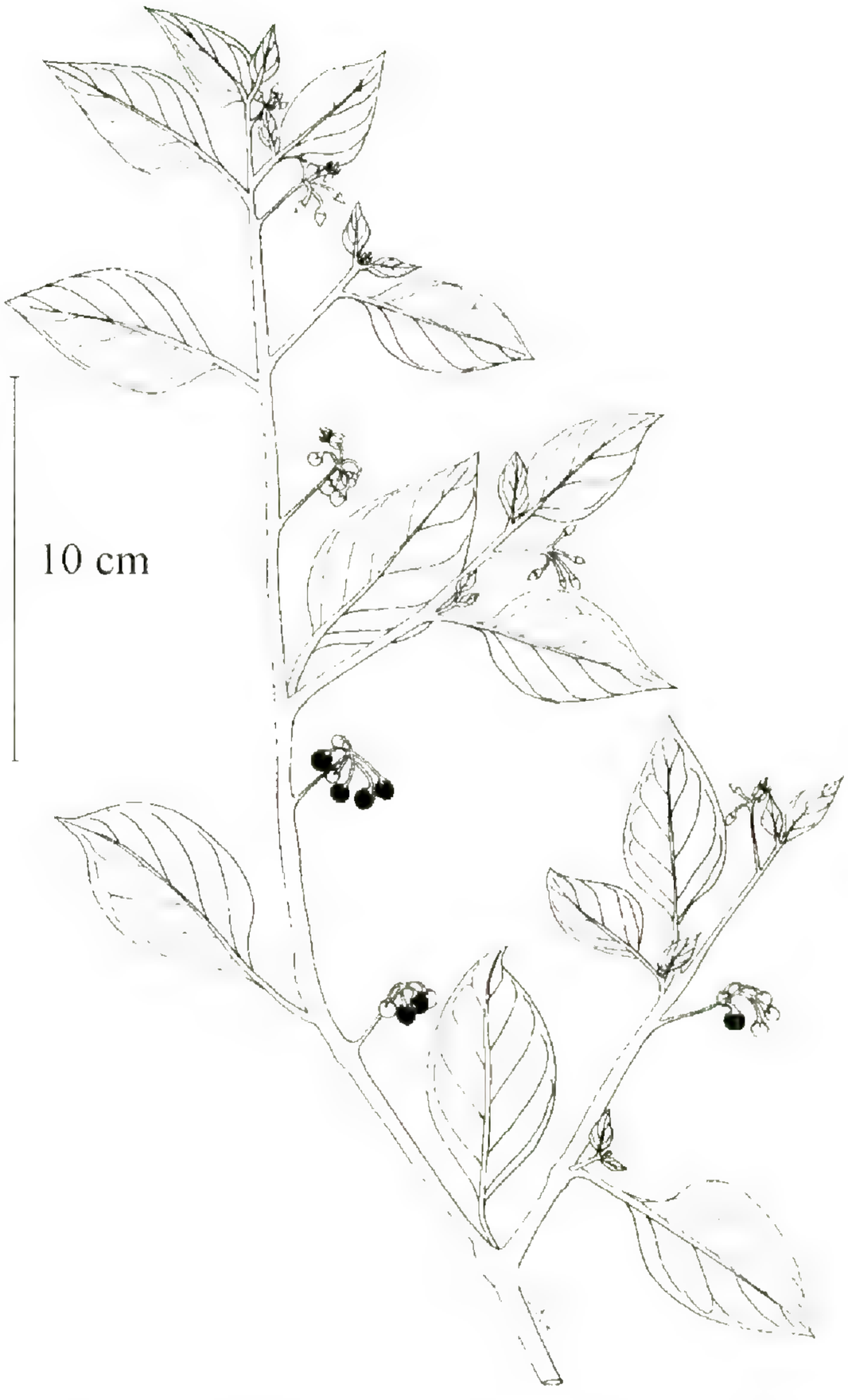

Figure 1. *Solanum scabrum* L. subsp. *laevis* Olet, the wild subspecies of the garden huckleberry. Drawn by Janet Nabakooza from the holotype *E. A. Olet 88* (MHU).

Habitat and distribution. Along streams and in open parts of upland forests, especially Mt. Ruwenzori, but also in gardens and banana plantations, 1080–2500 m.

Phenology. In Uganda flowering is reported in February, March, May, August, November, and December, and fruiting in the same months.

Conservation status. This taxon is here assessed as Least Concern (LC), using the criteria detailed by IUCN (2001).

Note. Although we are describing subspecies *laevis* from Uganda only, it is very likely a mostly West African plant with its easternmost distribution area in Uganda. It is likely that West African wild forms are so intermixed with the cultivated plants that they are less easily recognized than in Uganda, where cultivation is very restricted.

Paratypes. UGANDA. Eastern region, Busoga, Kamuli dist., Bulamogi co., Namugongo subco., Bukomankola, 2 km W of Kaliro town, *E. A. Olet 11* (K, MHU); Mwiga, 4 km NW of Kaliro, *E. A. Olet 14* (MHU, NLH); 1 km W of Kaliro, *E. A.*

Olet 15 (K, MHU). Central region, Buganda, Kampala dis., Kawempe div., Kawempe south, Makerere University, *E. A. Olet 70* (EA, MHU).

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Literature Cited

Beadle, G. W. 1980. The ancestry of corn. Sci. Amer. 242: 112–119.

Bensch, S. & M. Åkesson. 2005. Ten years of AFLP in ecology and evolution: Why so few animals? Molec. Ecol. 14: 2899–2914.

Berinyuy, J. E., D. A. Fontem, D. A. Focho & R. R. Schippers. 2002. Morphological diversity of *Solanum scabrum* accessions in Cameroon. Pl. Genet. Resources Newslett. No. 131: 42–48.

Bukenya, Z. R. & J. F. Carasco. 1995. *Solanum* (Solanaceae) in Uganda. Bothalia 25(1): 43–59.

Defelice, M. S. 2003. The black nightshades, *Solanum nigrum* L. et al.—Poison, poultice, and pie. Weed Technol. 17: 421–427.

Doebley, J. 2004. The genetics of maize evolution. Annual Rev. Genet. 38: 37–59.

Edmonds, J. M. 1972. A synopsis of the taxonomy of *Solanum* sect. *Solanum* (*Maurella*) in South America. Kew Bull. 27(1): 79–114.

———. 1979. Nomenclatural notes on some species of *Solanum* L. found in Europe. Bot. J. Linn. Soc. 78: 213–233.

——— & J. A. Chweya. 1997. Black Nightshades. *Solanum nigrum* L. and Related Species—Promoting the Conservation and Use of Under-utilised and Neglected Crops 15. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Genetic Resources Institute, Rome, Italy.

Fanizza, G., R. Chaabane, F. Lamaj, L. Ricciardi & P. Resta. 2003. AFLP analysis of genetic relationships among aromatic grapevines (*Vitis vinifera*). Theor. Appl. Genet. 107: 1043–1047.

Heine, H. H. 1960. Notes on *Solanum*. Kew Bull. 14(2): 245–249.

Henderson, R. J. F. 1974. *Solanum nigrum* L. (Solanaceae) and related species in Australia. Contr. Queensland Herb. No. 16: 1–78.

Heun, M., R. Schäfer-Pregl, D. Klawan, R. Castagna, M. Accerbi, B. Borghi & F. Salamini. 1997. Site of Einkorn Wheat Domestication Identified by DNA Fingerprinting. Science 278: 1312–1314.

IUCN. 2001. IUCN Red List Categories: Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.

Lara-Cabrera, S. I. & D. M. Spooner. 2004. Taxonomy of North and Central American diploid wild potato (*Solanum* sect. *Petota*) species: AFLP data. Pl. Syst. Evol. 248: 129–142.

Lester, R. N. & M.-C. Daunay. 2004. Diversity of African vegetable *Solanum* species and its implications for a better understanding of plant domestication. Pp. 137–152 *in* H. Knüpffer & J. Ochsmann (editors), Proceedings of a Symposium Dedicated to the 100th Birthday of Rudolf Mansfeld, Gatersleben, Germany, 8–9 October 2001. Institut für Pflanzengenetik und Kulturpflanzenforschung, Gatersleben.

Matsuoka, Y., Y. Vigouroux, M. M. Goodman, J. Sanchez, G., E. Buckler & J. Doebley. 2002. A single domestication for maize shown by multilocus microsatellite genotyping. Proc. Natl. Acad. Sci. U.S.A. 99(9): 6080–6084.

Miller, P. 1768. The Gardeners Dictionary, 8th ed. London.

Olet, E. A. 2004. Taxonomy of *Solanum* L. section *Solanum* in Uganda. Doctor Scientiarum Theses 2004: 41, Agricultural Univ. Norway, Ås.

———, M. Heun & K. A. Lye. 2005. African crop or poisonous nightshade; the enigma of poisonous or edible black nightshade solved. African J. Ecol. 43: 158–161.

Spooner, D. M., K. McLean, G. Ramsay, R. Waugh & G. J. Bryan. 2005. A single domestication for potato based on multilocus amplified fragment length polymorphism genotyping. Proc. Natl. Acad. Sci. U.S.A. 102(41): 14694–14699.

Szabó, V. M. & B. Burr. 1996. Simple inheritance of key traits distinguishing maize and teosinte. Molec. Gen. Genet. 252: 33–41.

van de Wouw, M., N. Maxted, K. Chabane & B. V. Ford-Lloyd. 2001. Molecular taxonomy of *Vicia* ser. *Vicia* based on Amplified Fragment Length Polymorphisms. Pl. Syst. Evol. 229: 91–105.

Vos, P., R. Hogers, M. Bleeker, M. Reijans, T. van de Lee, M. Hornes, A. Frijters, J. Pot, J. Peleman, M. Kuiper & M. Zabeau. 1995. AFLP: A new technique for DNA fingerprinting. Nucl. Acids Res. 23(21): 4407–4414.

Weising, K., H. Nybom, K. Wolff & G. Kahl. 2005. DNA Fingerprinting in Plants. Principles, Methods, and Applications, 2nd ed. CRC Press, Boca Raton.

A New Central African Species, *Cyperus vandervekenii* (Cyperaceae), from the Sources of the Nile in Rwanda

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Abstract. *Cyperus vandervekenii* Reynders, Dhooge & Goetghebeur, from Rwanda, is fully described and illustrated. It can easily be distinguished from the related *Cyperus graciliculmis* Lye by its slender subquadrangular culms, single pseudolateral spikelets, and by the associated bract shorter than the spikelet.

Key words: Cyperaceae, *Cyperus*, Rwanda.

In his study of the Cyperaceae of Rwanda for the *Flore du Rwanda*, Maquet (1987: 446) considered the species *Cyperus* cf. *graciliculmis* Lye, as identified by Lye. *Cyperus graciliculmis* was originally described (Lye, 1983) as bearing two to three spikelets per inflorescence and is known only from a few collections from very steep mountain slopes of Mt. Mnyera (2075 m) in the Ukagura Mountains in Tanzania (Haines & Lye, 1983: 161). In a recent study of the Cyperaceae of Rwanda and Burundi (Reynders, 2004), taking into account the solitary spikelets and other features, we consider the specimens from Rwanda as a new species.

Cyperus vandervekenii Reynders, Dhooge & Goetghebeur, sp. nov. TYPE: Rwanda. Gikongoro: Rugera, valley of the Birara, ca. 2300 m, 7 Sep. 1974, *P. Van der Veken 11146* (holotype, GENT; isotypes, BR, EA, K, M, MO, P, WAG). Figures 1, 2.

Herba perennis, caespitosa rhizomata gracilia rubra; culmi filiformes, erecti et subquadriquetri; folia redacta; spicula solitaria (rarissime 2 vel 3), pseudolateralis.

Perennial herb, forming dense tufts with red, slender rhizomes (Fig. 1A); roots dark brown to reddish brown; culms (2.5–)7–19(–35) × 0.01–0.04 cm, slender, erect, ribbed-rectangular with 6 to 8 rounded ribs (Fig. 1G, H), smooth. Leaves all basal and reduced to their sheaths; sheaths up to 4 cm long, red; blades reduced to 0.8–2(–3.1) mm, suddenly narrowing into a mucro; mucro (0.1–)0.3–1.3(–2.5) mm, red, margins glabrous. Inflorescence a single, pseudolateral and sessile spikelet, rarely 1 or 2 additional spikelets, 7–21 × (1.5–)4–9(–16) mm. Flowers 4 to 11(rarely to 21) per spikelet (Fig. 1B, 2A); involucral bracts 2; lower bract pseudoterminal, (1.3–)2–4(–5.3) × 0.4–1.4 mm; bract mucro 0.6–1 mm, scabrous near the apex; the second bract 0.8–1.8 × 0.2–0.8 mm, including a mucro 0.1–0.7(–1) mm long; rachilla 0.3–0.6 mm wide, persistent, narrowly winged; base of the spikelet with 1 small persistent glume-like bract that is half as long as the other glumes (Fig. 2A). Glumes 1.3–2.2 × 0.45–0.9 mm (measured on folded glume), distichous, ovate to nearly orbicular, rounded, green-red, glabrous, with a green 3-nerved midrib that starts between 1/3 and 1/2 of the glume, ending in a short mucro; mucro up to 0.1 mm, straight or slightly recurved; sometimes bearing 1 to 2 additional and hardly visible nerves at each side of the midrib (Fig. 1E); flowers bisexual (Fig. 1F); stamens 3; anthers 0.4–0.7 mm, with a short and spinulose appendage (Fig. 2B); filaments 0.8–2 × 0.1–0.15 mm; ovary 3-merous; style 0.1–0.8 mm, stigma branches 3, 0.5–1.2 mm. Achene 1–1.3 × 0.5–0.7 mm, obovate to elliptical, trigonous and often slightly compressed, light reddish brown to white, smooth (Fig. 1C, D; 2B–E); style base sometimes persisting on the nutlet as a short mucro.

The genus *Cyperus* L. s. str. comprises about 600 species worldwide. It can be recognized by its distichous spikelets with several to many fertile glumes, its flowers without perianth, and its inflorescence that usually consists of an anthela with conspicuous involucral bracts. The style is trifid, less often bifid, and the rachilla of the spikelet is persistent or not (Kükenthal, 1935–1936: 33).

Cyperus vandervekenii is characterized by the reduction of the leaf blades, the bracts, and the number of spikelets. This can also be found in a few other African species such as *Cyperus laevigatus* L., which, however, has a dorsivertrally compressed pistil. *Cyperus graciliculmis* from Tanzania is the most similar species, but differs both biogeographically and morphologically. The principal differences between the two species are given in Table 1.

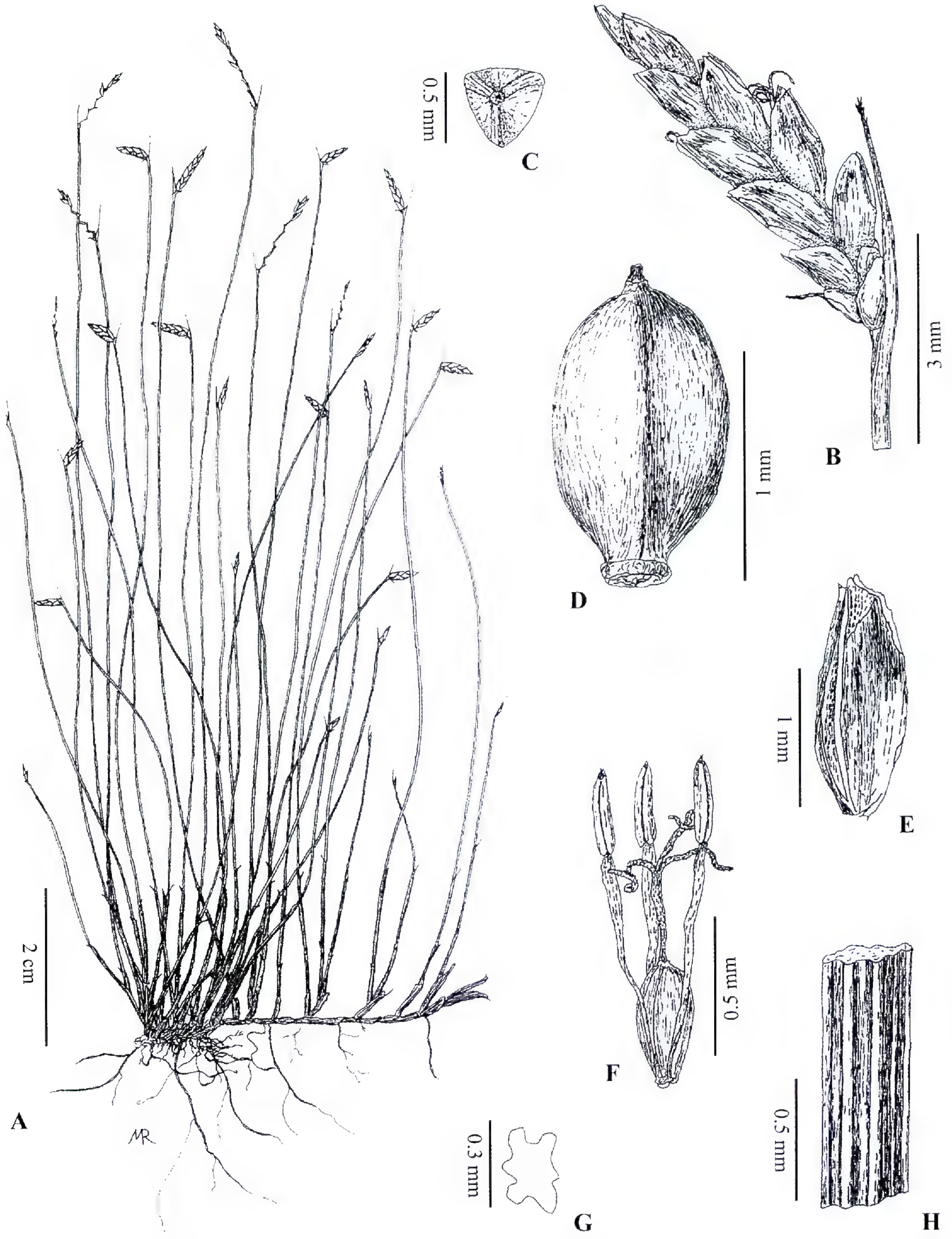
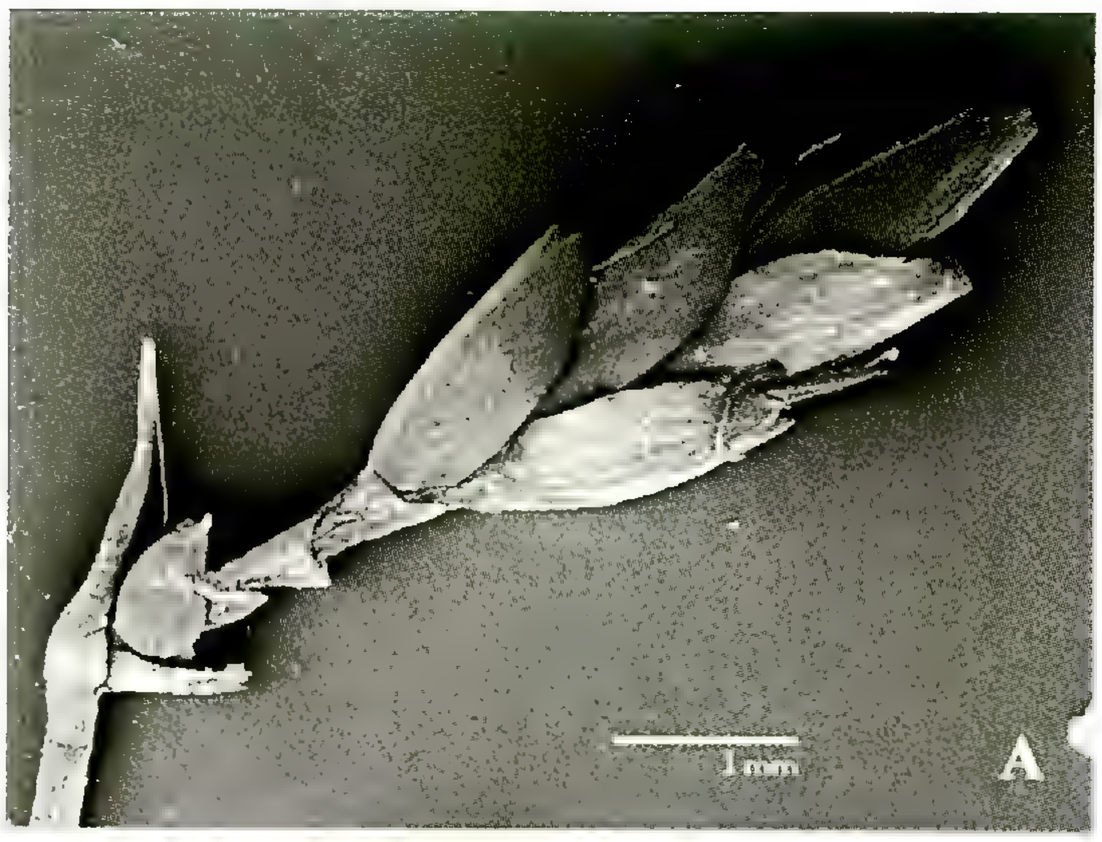
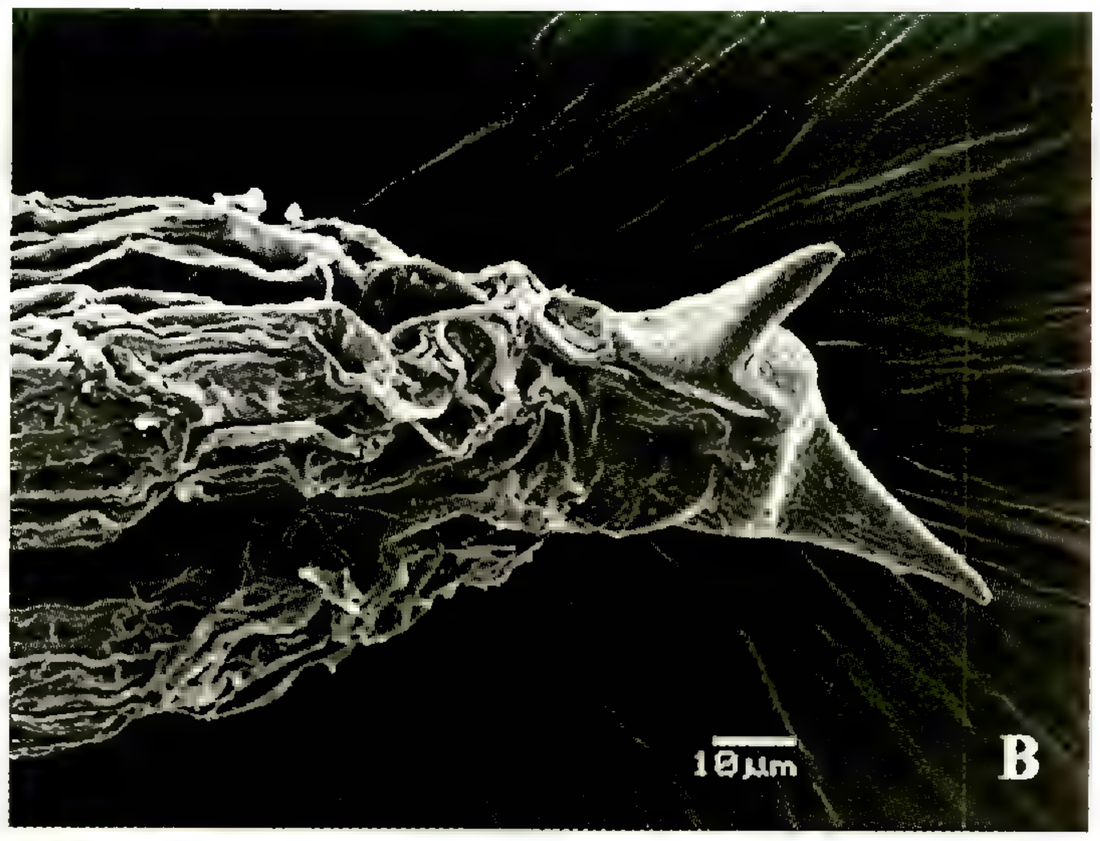


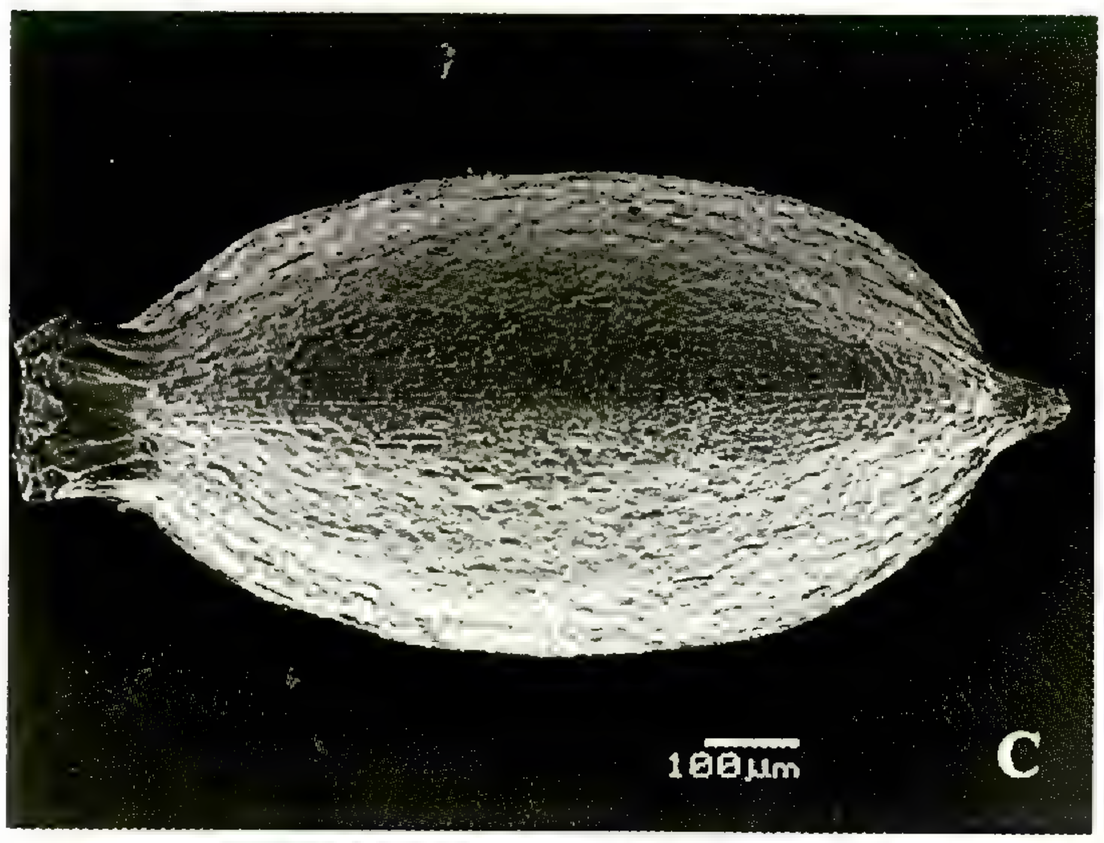
Figure 1. *Cyperus vanderrekenii* Reynders, Dhooge & Goetghebeur. —A. Habit. —B. Inflorescence. —C. Fruit, upper view. —D. Fruit, lateral view. —E. Glume. —F. Flower. —G. Stem section. —H. Stem detail. (Drawn from the holotype, *Van der Veken 11146*, GENT, by M. Reynders.)

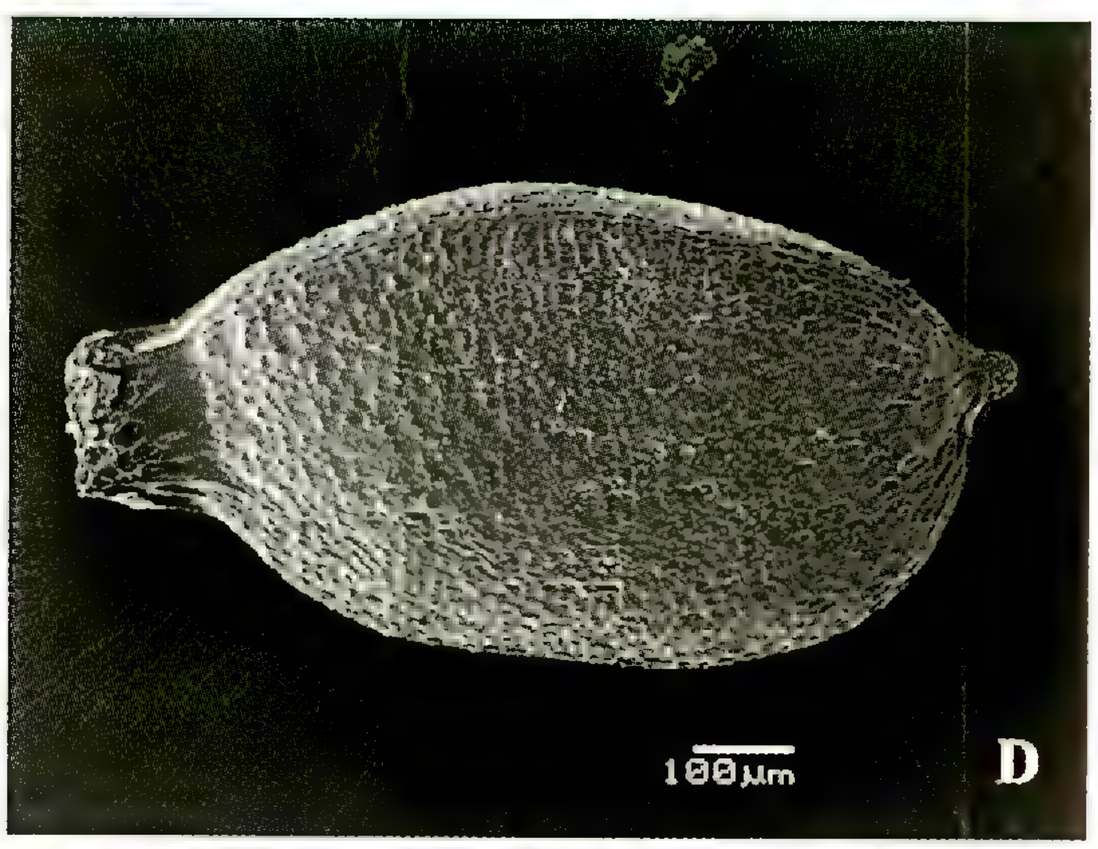
Due to the strong reduction of most parts of the plant, it is difficult to identify the section where *Cyperus vandervekenii* belongs; a molecular study could, however, bring more clarity.

Cyperus vandervekenii is a bog dweller known only from a few locations in the valley of the Birara River in Rugera and Rwasenkoko, east of the Congo–Nile ridge. It flourishes in *Erica* L. tussocks and *Sphagnum*









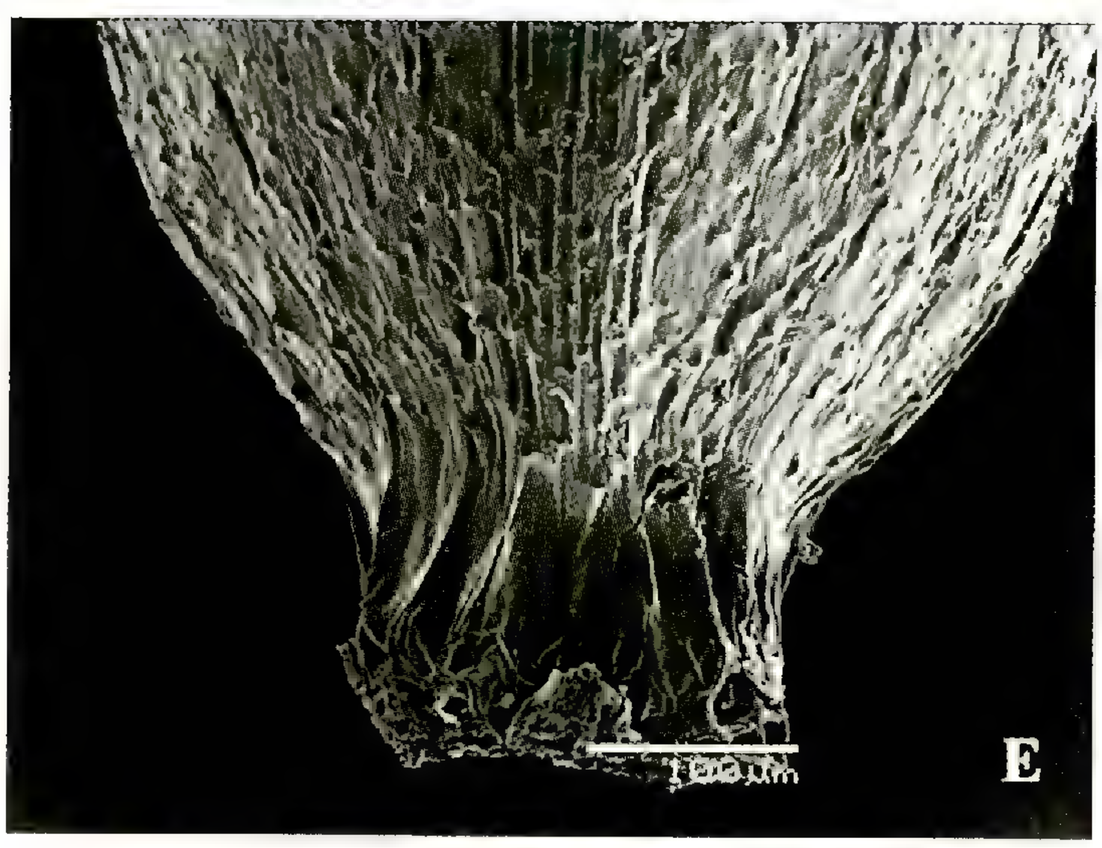


Figure 2. *Cyperus vandervekenii* Reynders, Dhooge & Goetghebeur, SEM images. —A. Inflorescence. —B. Anther top. —C. Symmetrical fruit. —D. Asymmetrical fruit. —E. Fruit base. —F. Fruit wall surface. (*Van der Veken 11146*, GENT.)

L. cushions. Several specimens have been collected from these locations. Maquet (1987: 146) cited the following specimens with the same characteristics as *Van der Veken 11146*: *Habyaremye 713*, *Reynders 153* and *226*, and *Van der Veken 11140*. After consulting the collector, the latter citation seems to be a typographical error of *Van der Veken 11146* in the "Flora of Rwanda." The Habyaremye and Reynders collections could not be located in the BR herbarium for this study. It should also be remarked that the collector "Reynders" is not the same person as the first author.

We are very pleased to be able to dedicate this delicately beautiful new species to its type collector, P. Van der Veken. He is one of the founding fathers of the modern systematic approach in cyperology. His seminal work on the embryology of the Cyperaceae has led to a much better understanding of generic affinities and tribal delimitations within the family (Van der Veken, 1964, 1965).

Table 1. Morphological comparison of *Cyperus vandervekenii* and *C. graciliculmis*.

	Cyperus vandervekenii	*Cyperus graciliculmis*
Culm		
dimensions, cm	(2.5–)7–19(–35) × 0.01–0.04	20–50 × 0.03–0.06
cross section	subquadrangular	triangular or angular
Leaf		
color	reddish brown	green or brown
blade	only a long mucro is present, the rest of the leaf blade is absent	leaf blade short but not entirely reduced to only a mucro
scabrid	not scabrid	scabrid
Inflorescence		
no. of spikelets	1 sessile spikelet, rarely 1 or 2 additional sessile spikelets	2 or 3 sessile spikelets, rarely 1 additional stalked spikelet
involucral bracts	2, lower bract (0.13–0.53 cm), shorter than spikelets	2 or 3, lower bract (2–5 cm), longer than spikelets
Habitat	bogs	steep mountain slopes
Location	Birara valley, Rwanda	Top of Mt. Mnyera, Tanzania

Acknoucledgments. We thank Marcel Verhaegen (BR) for the SEM images and J. Rammeloo, director of the National Botanical Garden of Belgium, for his continuing support of Belgian botanists. Isotypes of the new species will be distributed among herbaria.

Literature Cited

Haines, R. W. & K. A. Lye. 1983. The Sedges and Rushes of East Africa. East African Natural History Society, Nairobi.

Kükenthal, G. 1935–1936. Cyperaceae–Scirpoideae–Cypereae. *In* A. Engler, Das Pflanzenreich, Regni Vegetabili Conspectus: IV, 20(101). H. R. Engelmann (J. Cramer), Stuttgart.

Lye, K. A. 1983. Studies in African Cyperaceae 25. New taxa and combinations in *Cyperus* L. Nordic J. Bot. 3: 224.

Maquet, P. 1987. Cyperaceae. *In* G. Troupin (editor), Flore du Rwanda: Spermatophytes, Vol. IV. Agence de coopération culturelle et technique, Musée Royal de l'Afrique centrale, Tervuren, Belgique.

Reynders, M. 2004. De Cyperaceae van Rwanda en Burundi, bijdrage tot een nieuwe flora. Scriptie, Licentiaat in de Biologie, Universiteit Gent, Belgium.

Van der Veken, P. 1964. Bijdrage tot de systematische embryologie der Cyperaceae–Cyperoideae. Doctoraal proefschrift, Katholieke Universiteit Leuven.

———. 1965. Contribution à l'embryographie systématique des Cyperaceae–Cyperoideae. Bull. Jard. Bot. État 35: 285.

Kyllinga beninensis (Cyperaceae), a New Species from Bénin

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Abstract. *Kyllinga beninensis* Samain, Reynders & Goetghebeur, a new species of Cyperaceae from the Borgou-Sud region of Bénin, is fully described and illustrated. This species can be recognized by the slender habit with swollen stem base, the tiny white head consisting of a single spike, and the spikelets with two glumes and one flower. Morphological differences with the species *K. microbulbosa* Lye from East Africa, to which *K. beninensis* bears a superficial resemblance, are discussed.

Key words: Bénin, Cyperaceae, *Kyllinga*.

Since 1997, botanists of both the National University of Bénin and Wageningen University (The Netherlands) have been cooperating on the "Projet d'aménagement d'un Herbier National et de rédaction de la Flore Analytique du Bénin." One of the aims of this project is the publication of a flora for Bénin. In a recent study of the Cyperaceae for this flora (Samain & Goetghebeur, 2006), an enigmatic specimen of *Kyllinga* Rottbøll was noticed. After identification attempts with several keys for African species of *Kyllinga* (Hooper, 1972; Haines & Lye, 1983; Scholz & Scholz, 1983), it became evident that we had discovered a new species in the genus *Kyllinga*.

Kyllinga beninensis Samain, Reynders & Goetghebeur, sp. nov. TYPE: Bénin, Borgou, Tchaourou, Ouari-Maro, 27 Aug. 1999, *B. Sinsin 3038* (holotype, WAG). Figures 1, 2.

Herba perennis tenuis; basis culmi tumida. Bracteae involucrales 2–3; spica solitaria terminalis, ovoidea ad globosa; spiculae numerosae. Spicula constans biglumosa et uniflora; glumae albidae ad stramineae, translucidae ubi maturae, obtusae ad apicem. Achenium lateraliter biconvexum, complanatum, ellipsoideum, ferrugineum ad badium, papillosum seriebus longitudinalibus, obtusum ad apicem, interdum basi styli persistentis ut apiculo brevi.

Small, perennial herb with a swollen stem base 2–3 mm thick, covered by persistent red-brown scales, stems few together, loosely connected (Fig. 1A, B); culms 10–20 × 0.02–0.04 cm, angular with rounded ribs, glabrous (Fig. 1C). Leaves basal, laminae well developed, 1.5–6 cm, linear, enrolled when dry, scabrid on edges near top (Fig. 1D). Inflorescence capitate, consisting of a single white, ovoid to globose spike, 2–5 mm, with many spirally placed spikelets (Fig. 1E); receptacle narrowly ovoid to cylindrical, to 1 × 0.5 mm (Fig. 1F); involucral bracts 2 or 3, spreading or slightly reflexed, scabrid on edges and underside of midrib near the top, V-shaped in cross section, largest bract 1–3 cm, second bract 0.5–1.2 mm. Spikelet 1–1.3 mm, consisting of 2 glumes and 1 flower (Fig. 1G, 2A); glumes white or straw-colored, translucent when mature, 1–1.3 mm; glume midrib straw-colored, raised, glabrous, with obtuse apex; nerves on each side of the midrib 2 or 3, raised and straw-colored. Nutlet biconvex, laterally flattened, ellipsoidal with asymmetrical attachment, 0.9–1.1 × 0.4–0.5 mm, light to dark brown, surface with small papillae in longitudinal rows, apex obtuse, base of the style sometimes remaining as a short apiculus (Fig. 1H, I; 2B, C).

The genus *Kyllinga* can easily be distinguished from other Cyperaceae by its headlike inflorescence, small and few-glumed spikelets, and laterally compressed nutlets with two style branches (Getliffe, 1983; Goetghebeur, 1998; Tucker, 1984). These reduced characters result in a strong similarity among the different species and a difficult taxonomy of the genus. Vegetative characters such as stolons, rhizomes, stem bases with persistent leaf sheaths, and leaf and culm characteristics are very important to distinguish the different species of *Kyllinga*. Unfortunately, these structures are often not collected so that many collections can hardly be identified with certainty.

Identification of the specimen with the Flora of West Tropical Africa key(s) (Hooper, 1972) gives *Kyllinga echinata* S. S. Hooper. This species, however, has larger spikes 8–10 mm wide, old leaf sheaths that decay into black fibers, and long-tipped spikelets. Using key(s) in Scholz and Scholz (1983) brings us to *K. nigritana* C. B. Clarke, which has reddish glumes (when dry) with a wide ciliate wing (not present on the specimen). Identification key(s) in *The Sedges and Rushes of East Africa* (Haines & Lye,

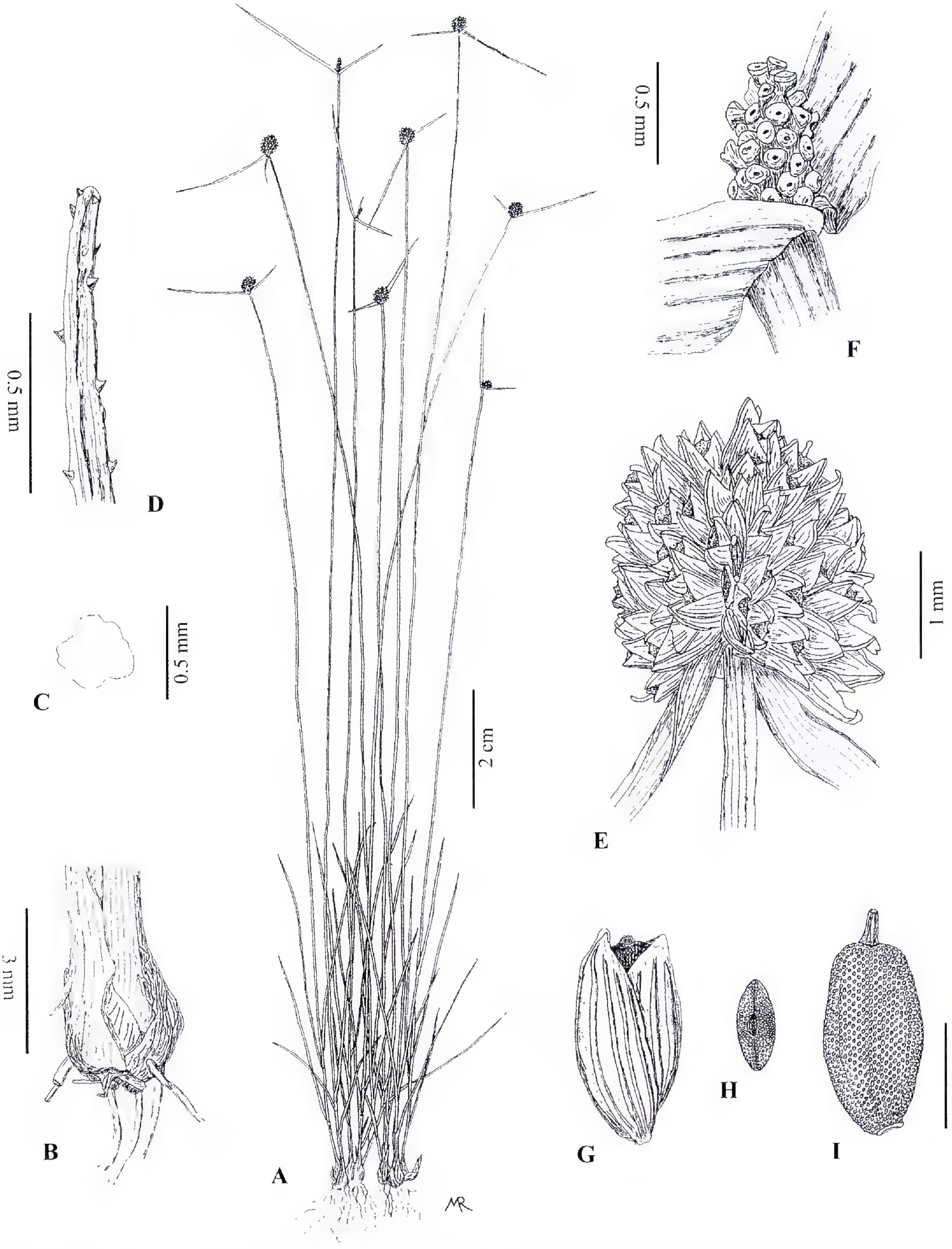
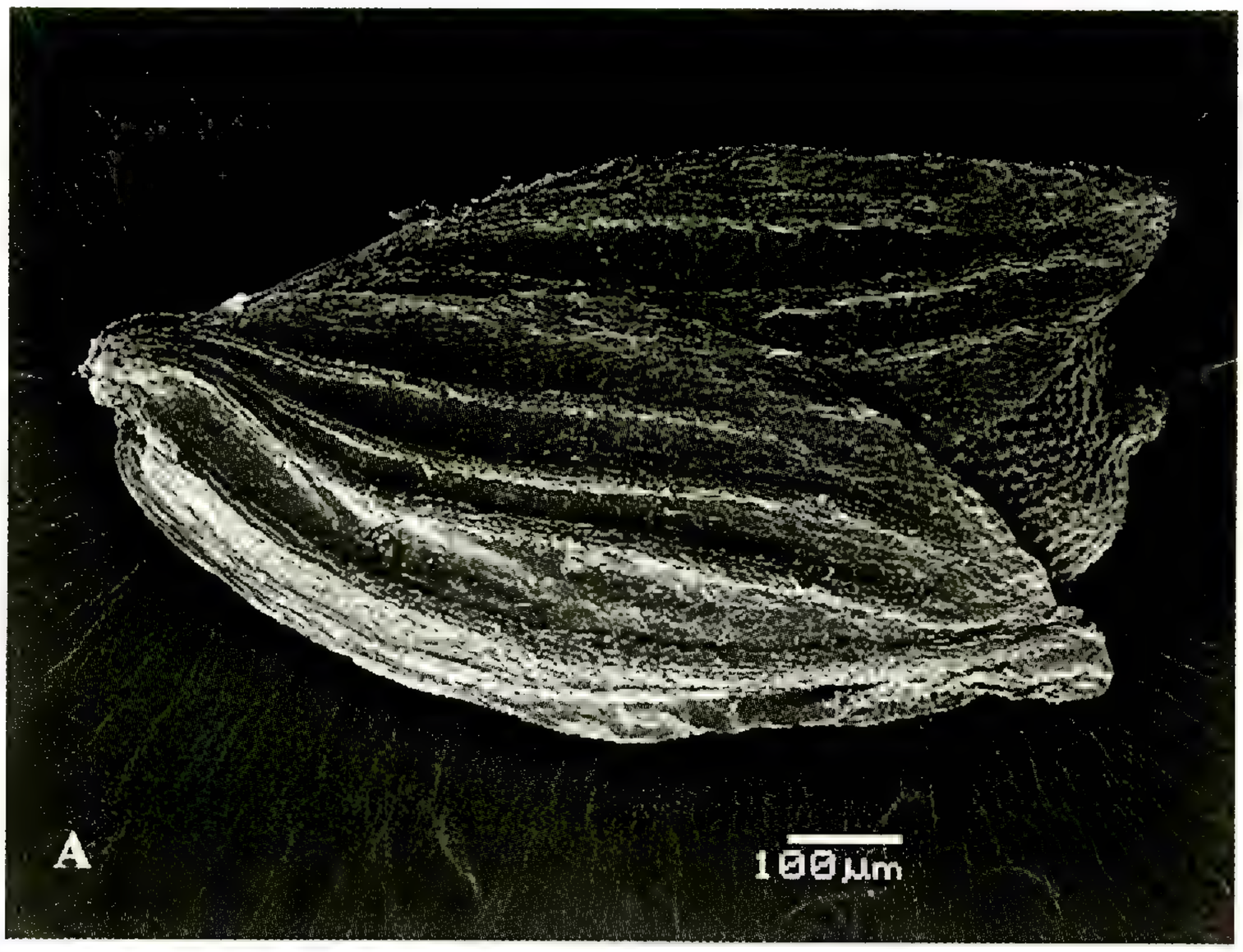
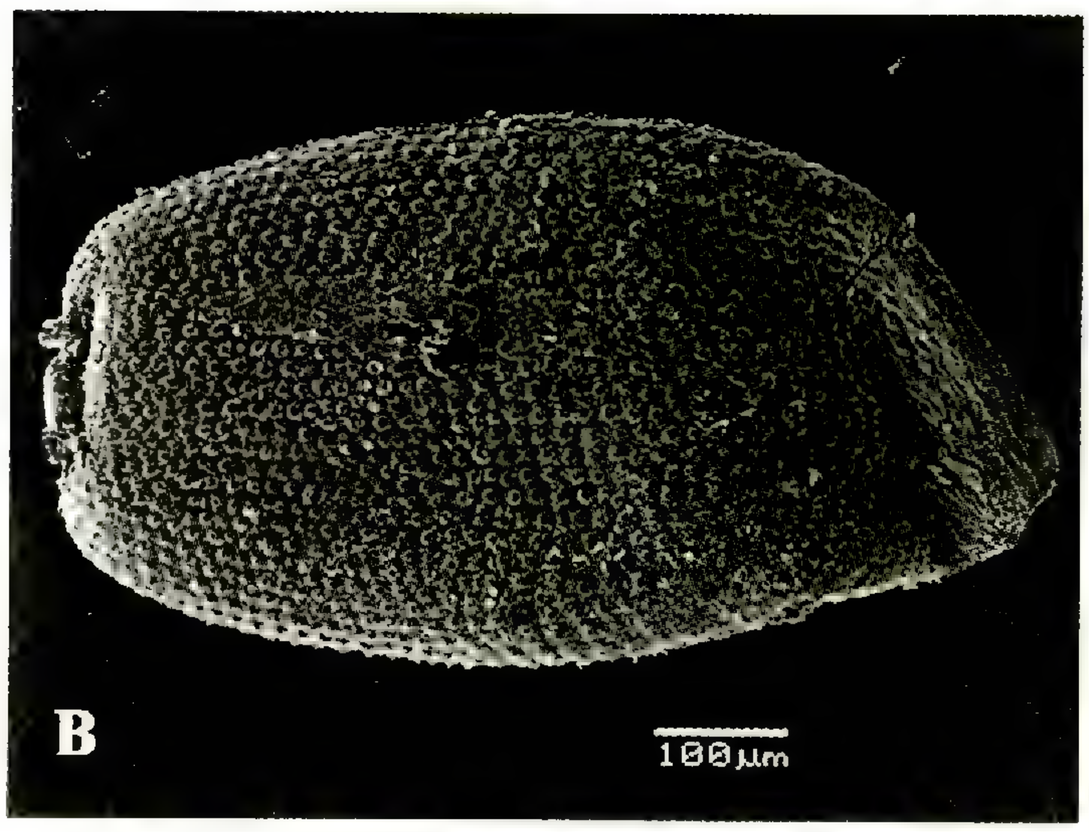


Figure 1. *Kyllinga beninensis* Samain, Reynders & Goetghebeur. —A. Habit. —B. Swollen stem base. —C. Culm section. —D. Leaf tip. —E. Inflorescence. —F. Receptaculum. —G. Spikelet. —H. Fruit, upper view. —I. Fruit, lateral view. (Drawn from the holotype, *Sinsin 3038*, WAG, by Marc Reynders.)

1983) lead to *K. microbulbosa* Lye. The resemblance is rather good, but *K. microbulbosa* has much larger glumes and spikelets with more flowers per spikelet than the novel specimen from Bénin (Lye, 1972). Key distinguishing morphological features of these two species are given in Table 1.

Kyllinga beninensis is characterized by the slender habit and swollen stem base. The white head with





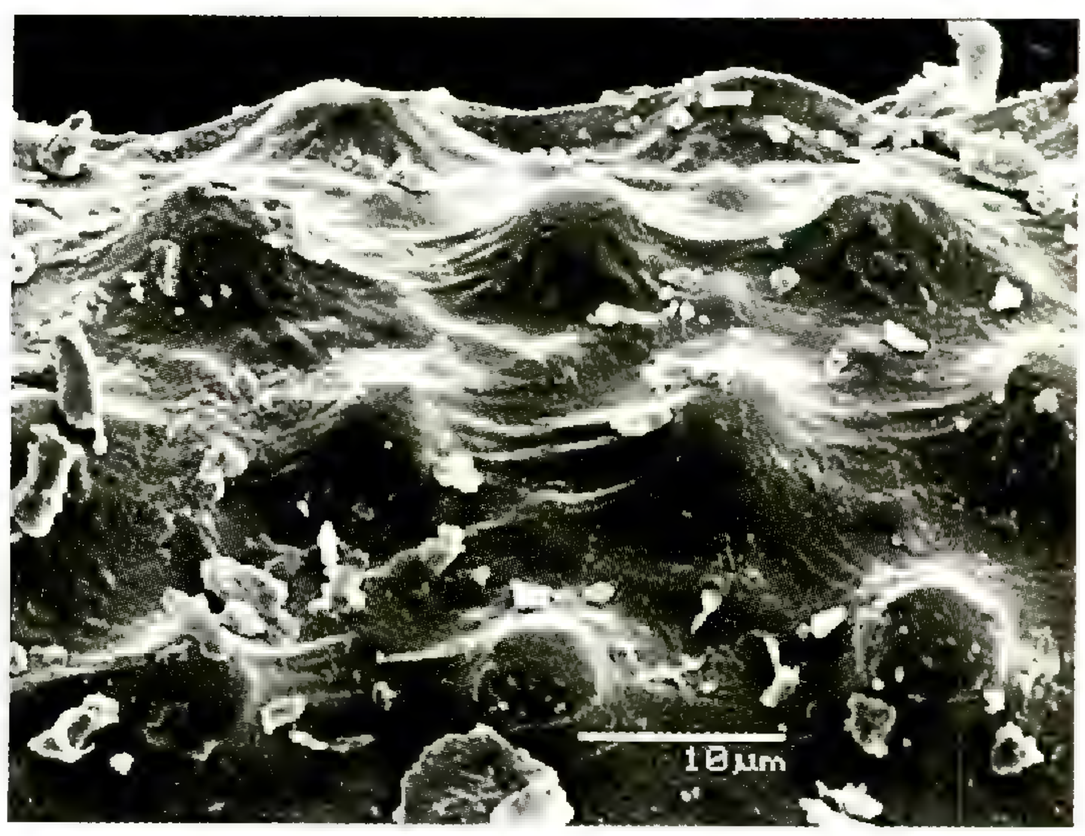


Figure 2. *Kyllinga beninensis* Samain, Reynders & Goetghebeur, SEM images. —A. Spikelet. —B. Nutlet. —C. Detail of the surface of a nutlet. (*Sinsin 3038*, WAG.)

a single spike, the small spikelets with only two glumes that lack appendages, and the achene with papillae in longitudinal rows are other important characters of this species.

The Borgou-Sud region in Bénin, where the only known specimen of this new species was collected, is the northern part of the Guineo-Sudanian transition zone. This region is characterized by a mosaic of woodlands, dense dry forests, and tree- and shrub-savannas, and is the northern equivalent of the miombo woodland south of the equator (Adjanohoun et al., 1989; Houinato & Sinsin, 2001).

Table 1. Main distinguishing characters of *Kyllinga beninensis* and *K. microbulbosa* (characters of *K. microbulbosa* after Lye, 1972).

	K. beninensis	*K. microbulbosa*
Spikelet length, mm	1–1.3	2–3
Glume length, mm	1–1.3	2–2.5
Flowers per spikelet	1	1 to 3

Acknowledgments. We express our gratitude to the curator of the Herbarium Vadense (WAG). We thank Marcel Verhaegen (BR) for the beautiful SEM images and Jan Rammeloo, director of the National Botanical Garden of Belgium, for his continuing effort in supporting Belgian botanists.

Literature Cited

Adjanohoun, E. J., V. Adjakidjè, M. R. A. Ahyi, L. Ake Assi, A. Akoègninou, J. d'Almeida, F. Apovo, K. Boukef, M. Chadaré, G. Cusset, K. Dramane, J. Eyme, J.-N. Gassita, N. Gbaguidi, E. Goudoté, S. Guinko, P. Houngnon, Issa Lo, A. Keita, H. V. Kiniffo, D. Koné-Bamba, A. Musampa Nseyya, M. Saadou, T. Sodogandji, S. de Souza, A. Tchabi, C. Zinsou Dossa & T. Zohoun. 1989. Contribution aux études ethnobotaniques et floristiques en République

Populaire du Bénin. Médecine traditionnel et pharmacopée. Agence de Coopération Culturelle et Technique (ACCT), Paris.

Getliffe, F. M. 1983. Studies in Cyperaceae in Southern Africa: 10. The genus *Kyllinga* Rottb. J. S. African Bot. 49(3): 261–304.

Goetghebeur, P. 1998. Cyperaceae. Pp. 141–190 *in* F. Kubitzki, H. Huber, P. J. Rudall, P. S. Stevens & T. Stützel (editors), The Families and Genera of Vascular Plants. Springer-Verlag, Berlin.

Haines, R. W. & K. A. Lye. 1983. The Sedges and Rushes of East Africa. East African Natural History Society, Nairobi.

Hooper, S. S. 1972. *Kyllinga*. Pp. 303–311 *in* J. Hutchinson & J. M. Dalziel (editors), Flora of West Tropical Africa (2nd ed.), Vol. III, part 2. Crown Agents for Overseas Governments and Administrations, London.

Houinato, M. & B. Sinsin. 2001. Analyse phytogéographique de la région des Monts Kouffé au Bénin. Syst. Geogr. Pl. 71: 889–910.

Lye, K. A. 1972. Studies in African Cyperaceae VI. New species and combinations in *Kyllinga*. Bot. Not. 125: 217–219.

Samain, M.-S. & P. Goetghebeur. 2006. Cyperaceae. Pp. 82–121 *in* A. Akoègninou, W. J. van der Burg & L. J. G. van der Maesen (editors), Flore Analytique du Bénin. Backhuys Publishers, Leiden.

Scholz, H. & U. Scholz. 1983. Flore descriptive des Cypéracées et Graminées du Togo. A. R. Gantner Verlag, Vaduz and Strauss & Cramer GmbH, Hirschberg.

Tucker, C. 1984. A revision of the genus *Kyllinga* Rottb. (Cyperaceae) in Mexico and Central America. Rhodora 86(848): 507–538.

Four New Myrtaceae from Eastern Brazil

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Abstract. *Myrcia clavija* Sobral, *Myrciaria pilosa* Sobral & Couto, *Plinia longiacuminata* Sobral, and *Plinia subavenia* Sobral are newly described and illustrated. *Myrcia clavija*, from montane forests of Minas Gerais, is related to *M. hexasticha* Kiaerskou, from which it differs by its 6-verticillate leaves, persistent bracteoles, and aristate calyx lobes. *Myrciaria pilosa*, from rocky fields of Bahia and forests of Minas Gerais, is close to *M. floribunda* (H. West ex Willdenow) O. Berg, differing by the pubescence of its leaves and flowers. *Plinia longiacuminata* and *P. subavenia* were collected from rainforests in coastal Bahia and Espírito Santo; the former is close to *P. edulis* (Vellozo) Sobral, differing from it by glabrous twigs and smaller leaves, and the latter is close to *P. involucrata* (O. Berg) McVaugh, from which it is distinguished by the glabrescence of leaves and fruits and by blades with the midvein adaxially sulcate. Comments on the conservation status of the species are also provided.

Resumo. *Myrcia clavija* Sobral, *Myrciaria pilosa* Sobral & Couto, *Plinia longiacuminata* Sobral e *Plinia subavenia* Sobral são descritas como novas e ilustradas. *Myrcia clavija*, das florestas montanas de Minas Gerais, é próxima a *M. hexasticha* Kiaerskou, diferindo pelas folhas 6-verticiladas, bractéolas persistentes e lobos do cálice aristados. *Myrciaria pilosa*, dos campos rupestres da Bahia e florestas de Minas Gerais, é afim a *M. floribunda* (H. West ex Willdenow) O. Berg, da qual se distingue pelas folhas e flores pilosas. *Plinia longiacuminata* e *P. subavenia* foram coletadas na mata atlântica da Bahia e Espírito Santo; a primeira se assemelha a *P. edulis* (Vellozo) Sobral, diferindo pelos ramos glabros e folhas mais estreitas, e a segunda é próxima a *P. involucrata* (O. Berg) McVaugh, da qual se distingue pelas folhas e frutos glabrescentes e lâminas com nervura central sulcada na face adaxial. São apresentados comentários sobre o status de conservação das espécies descritas.

Key words: Brazil, IUCN Conservation Status, *Myrcia*, *Myrciaria*, Myrtaceae, *Plinia*.

The family Myrtaceae in Brazil is presently represented by about 1000 species distributed in 20 genera (Landrum & Kawasaki, 1997). While examining recent collections from the coastal Brazilian rainforest (mata atlântica) and the rocky fields of Bahia, several undescribed species came to our attention; they are here proposed as new.

The terminology used for reproductive structures is that of current use in recent taxonomic papers on the family (e.g., Landrum, 1986; Kawasaki, 1989; Proença, 1990; Landrum & Kawasaki, 1997; Landrum, 2003; Sobral, 2003; Holst & Kawasaki, 2004). Briggs and Johnson (1979) have proposed a detailed terminology of inflorescences; nevertheless, although useful for phylogenetic approaches (e.g., Wilson et al., 2001), its specificity may make the terminology "only understandable to committed specialists" (Snow et al., 2003: 13).

Myrcia clavija Sobral, sp. nov. TYPE: Brazil. Minas Gerais: Descoberto, Res. Biol. Represa do Grama, 15 June 2001, *R. Forzza, B. Franco, P. Faria & L. Meireles 2193* (holotype, CESJ; isotype, RB). Figures 1A, 2.

Haec species *Myrciae hexastichae* Kiaerskou proxima, a qua foliis 6 verticillatis, bracteolis persistentibus et lobis calycinis longe aristatis distincta est.

Treelet 3–8 m high. Twigs and inflorescences covered with brown-tinged trichomes to 0.3–1 mm. Leaves verticillate, 6 at each node; petioles 3–7 × 1.2–3 mm. Blades narrowly oblong, 160–270 × 18–30 mm, discolored when dry; glandular dots less than 0.1 mm diam., scarcely visible on either surface even against light; apex acuminate to long-acuminate; base obtuse to cordate; midvein evident and salient on both sides; secondary veins in 40 to 60 pairs, evident and at least weakly salient on both sides; intersecondary

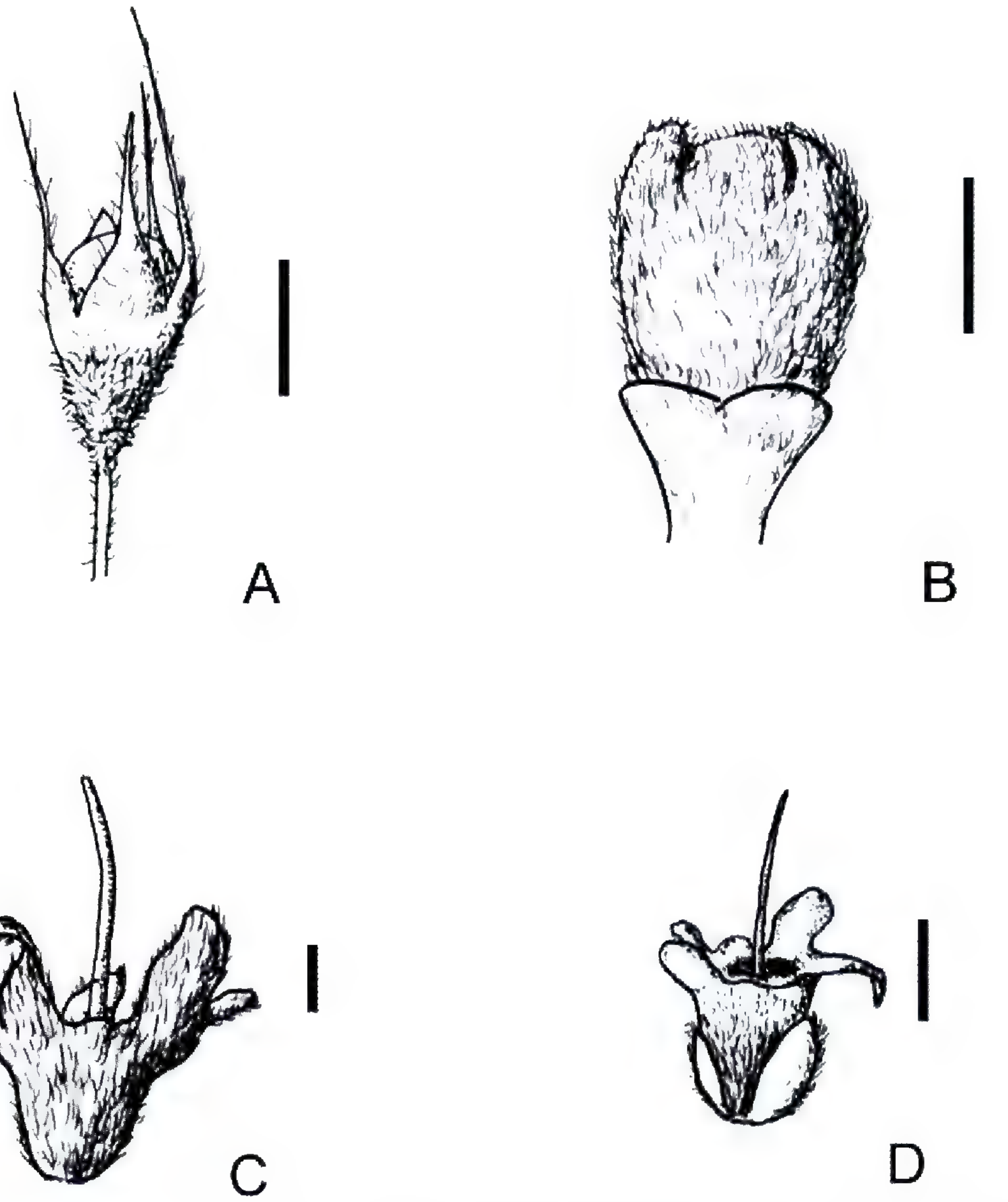

Figure 1. Schematic drawings. —A. *Myrcia clavija* Sobral: flower bud (*Faria et al. 118*, CESJ). —B. *Myrciaria pilosa* Sobral & Couto: flower bud (*França et al. 4169*, BHCB). —C. *Plinia longiacuminata* Sobral: old flower; bracteoles not represented (*Carvalho et al. 3451*, CEPEC). —D. *Plinia subavenia* Sobral: old flower (*Sant'Ana et al. 365*, holotype, CEPEC). Scales = 2 mm.

veins evident, slightly thinner than the secondary ones; intramarginal vein (sensu Carr et al., 1986: 58) 0.8–1 mm from the slightly revolute margin. Inflorescences paniculiform, occasionally with linear basal bracts to 15 × 2 mm, 50- to 100-flowered, terminal or lateral at defoliated nodes, up to 6 at a node, the main floral axis 100–230 × 1.2–1.5 mm, the secondary axes to 50 mm and occasional tertiary ones to 20 mm; bracts at the base of secondary axes linear, 4–15 × 0.2–1.5 mm; bracts at the base of flowers linear, to 2.5 × 0.2 mm; flowers sessile (sometimes several of them falling before anthesis along secondary or tertiary axes and so simulating long-pedunculate flowers); bracteoles triangular, just above the bracts, to 0.3 × 0.1 mm, persisting after anthesis. Flower buds obovate, to 3 × 2 mm, the ovary visibly distinct from the calyx, densely covered by brown-tinged trichomes to 0.3 mm; calyx lobes 5, triangular, reflexed at anthesis, unequal, 1–1.5 × 1–2 mm, at least 4 of them bearing a 1.5–2 mm long arista that generally breaks at anthesis; petals as far as observed 3, orbicular, concave, to 2 × 2.5 mm, glabrous or finely ciliate; stamens ca. 50, to 3 mm, the anthers globose, 0.2–0.3 × 0.3 mm, without evident glands; staminal ring 2.5–3 mm diam.; style 5 mm, the stigma punctiform and minutely papillose; calyx tube 0.8–1 mm deep; ovary bilocular with 2 ovules per locule. Fruits globose or slightly oblate, 10 × 10–12 mm, black when ripe, with 1 or 2 seeds 9–10 × 7–8 mm, with brown shining testa; embryo reniform, with well-developed hypocotyl and cotyledons.

Habitat, distribution, and phenology. *Myrcia clavija* is an understory tree to 8 m from ombrophilous montane forests of southeastern Minas Gerais, at altitudes of approximately 1000 m; until now it has been collected only in the municipality of Descoberto (about 21°30′S, 43°W), at the Represa do Grama biological reserve, a forest reserve with 263.8 ha (Neto et al., 2004). Flowering material was collected

Figure 2. Holotype specimen of *Myrcia clavija* Sobral (*Forzza et al. 2193*, CESJ).

in April and June, and fruiting material in September and November.

Conservation status. The presently known range of this species may be indicative of its narrow endemism. Considering the presently available information, *Myrcia clavija* can be considered an endangered species (category EN) because it fits IUCN's criteria (IUCN, 2001) B1 ab(iii), that is, it has an estimated range of less than 5000 km^2 (B1), it grows in a severely fragmented habitat and is known from less than five localities (a), and its habitat presents

a continuing decline in its extension (b(iii)), since although the species was collected in a preservation reserve, the neighboring areas are being intensely altered by anthropic activities such as farming.

Affinities. *Myrcia clavija* is apparently related to *M. hexasticha* Kiaerskou (for description see Kiaerskou, 1893: 72), collected along the coastal Brazilian Atlantic forest in the nearby state of Rio de Janeiro. The two species can be distinguished by the characters in the following key couplet:

1a. Branches with 3-verticillate leaves; bracteoles deciduous at anthesis; calyx lobes rounded . . . . . *Myrcia hexasticha*

1b. Branches with 6-verticillate leaves; bracteoles persistent after anthesis; calyx lobes aristate . . . . . *Myrcia clavija*

Etymology. The epithet alludes to the resemblance of the leaves to some *Clavija* Ruiz & Pavón species (Theophrastaceae); indeed, during the initial sorting of the extensive collections for the floristic study of Descoberto, this plant was initially filed under *Clavija*.

Paratypes. BRAZIL. **Minas Gerais:** Descoberto, Res. Biol. Represa do Grama, 15 Apr. 2000, *P. C. Faria, P. C. Zampa, R. Magalhães, P. O. Costa, L. F. Fazza, L. D. Meireles & S. M. Verardo 118* (CESJ); 10 June 2000, *F. Salimena, L. D. Meireles, P. C. Zampa, F. Magalhães, P. O. Costa & L. F. Fazza s.n.* (CESJ 31191A); *R. M. Castro, V. R. Almeida, P. C. Faria, B. Franco & L. Fernandes 658* (CESJ, RB); *R. Forzza, V. R. Scalon, L. D. Meireles, L. Menim Neto, V. R. Almeida & L. C. S. Assis 2219* (CESJ).

Myrciaria pilosa Sobral & Couto, sp. nov. TYPE: Brazil. Minas Gerais: Caratinga, Est. Biol. Caratinga, Mata do Jaó, 1 Dec. 2001, *J. V. Gomes 721* (holotype, BHCB; isotypes, MBM, MO, RB). Figures 1B, 3.

Haec species *Myrciariae floribundae* (H. West ex Willdenow) O. Berg proxima, a qua foliis abaxialiter pilosis et floribus dense sericeis distincta est.

Shrub to small tree 1.5–5 m high; cortex smooth and gray, peeling (according to *Harley 50471*); twigs glabrous or with scattered gray trichomes to 0.2 mm. Leaves with petioles 4–9 × 0.5–0.8 mm, glabrous or with scattered trichomes similar to the twigs; blades elliptic to lanceolate, 40–110 × 15–40 mm, discolored, the adaxial face glabrous, drying dark green or olive-green, the abaxial surface cinereous, with erect or appressed trichomes to 0.3 mm, persisting in adult leaves; glandular dots not visible adaxially and sometimes visible abaxially, occasionally evident when examined against light, to 0.1 mm diam., in some cases with 2 distinct sizes, some with less than 0.1 mm diam. and others to 0.2 mm diam.; apex acuminate, sometimes the midvein excurrent for 0.5–1 mm; base cuneate; midvein sulcate adaxially and salient abaxially; secondary veins in 12 to 20 pairs, occasionally visible and salient on both sides; intramarginal vein 0.5–0.8 mm from the slightly revolute margin. Inflorescences axillary or ramiflorous, 2- to 6-flowered, racemiform, the fertile axis 1.5–4 × 1 mm or occasionally absent; bracts ovate, 1–1.2 × 1 mm, glabrous or with gray trichomes to 0.2 mm; peduncles 1–2 × 1 mm, with trichomes 0.1–0.2 mm; bracteoles ovate, 0.8–1.2 × 1–1.5 mm, glabrous or sparsely pilose as the bracts. Flower buds obovate, 3–4 × 2.5–3 mm, entirely covered externally with whitened trichomes to 0.1 mm; calyx lobes 4, opening somewhat irregularly, 1–1.2 × 1–1.5 mm, glabrous within, pilose externally; petals rounded or obovate, 1.5–1.8 × 1.5 mm, ciliate; stamens ca. 70, 4–5 mm, the anthers globose, 0.2–0.3 × 0.2 mm, with 1 apical gland; style 7–8 mm, the stigma slightly capitate and papillose; calyx tube to 1 mm deep, glabrous; ovary 2-locular, with 2 ovules per locule. Fruits globose, to 10 mm diam., orange-colored or black when ripe, with a circular scar left by the deciduous calyx tube, 1-seeded; seeds reniform, 7 × 6 mm; embryo with cotyledons fused and without evident hypocotyl.

Habitat, distribution, and phenology. Shrub or small tree collected in forest edges in the municipalities of Abaíra, Ibicoara, Lençóis, Morro do Chapéu, and Mucugê in Central Bahia, at altitudes of 950–1100 m, and in ombrophilous forests in the municipality of Caratinga, Minas Gerais, at altitudes of 400–600 m; flowering material was collected in February, October, and December, and fruiting material in March, May, and December.

Conservation status. This species does not fit presently any of the IUCN criteria for threatened species (IUCN, 2001), considering its wide geographical distribution and occurrence in several distinct environments. Therefore, it can be considered for the moment a taxon of Least Concern (LC) for purposes of conservation.

Affinities. *Myrciaria pilosa* is close to the more widespread *M. floribunda* (H. West ex Willdenow) O. Berg (for description see Amshoff, 1951: 108, or Sobral, 2003: 139), from which it is distinguished by leaves with the abaxial side covered with gray trichomes and flowers densely covered with sericeous white trichomes.

Etymology. The epithet alludes to the presence of trichomes on the abaxial surface of the leaves and on the external surface of the flowers. In most species of *Myrciaria* O. Berg, leaves and especially flowers are consistently glabrous; few species have pilose flowers

HERBÁRIO DO DEPARTAMENTO DE BOTÂNICA - ICB - UFMG
PLANTAS DO BRASIL
MYRTACEAE
Espécie: *Myrciaria*
Localidade: Caratinga-MG. Estação Biológica de Caratinga, mata do Jaó
Data: 01/XII/2001
Coletor: J V Gomes 721
Determinador:
Obs.: "Goiabeira" ou "Falsa-pelada" Plot 2

Figure 3. Holotype specimen of *Myrciaria pilosa* Sobral & Couto (*Gomes 721*, BHCB).

and this character seems to be especially useful in identifying them (Sobral, 1993).

Paratypes. BRAZIL. **Bahia:** Abaíra, *R. Harley, D. Hind, E. Lughadha, V. Souza, C. Sakuragui & W. Ganev 50332* (CEPEC, HUEFS, K, SPF). *R. Harley, D. Hind, E. Lughadha, L. Souza, C. Sakuragui & W. Ganev 50171* (CEPEC, HUEFS, K, SPF); Ibicoara, *L. A. Passos & A. R. L. Nogueira 272* (ALCB, CEPEC); Lençóis, *I. Koch, M. Lisbôa & R. Belinello 686* (BHCB, UEC); Morro do Chapéu, *E. Vic Lughadha, F. França, P. Gasson & R. Harley PCD 5995* (ALCB, BHCB). *F. França, E. Melo & B. Marques da Silva 2813* (BHCB, HUEFS); Mucugê, *F. França, S. Atkins & B. M. da Silva 1169* (BHCB, HUEFS). **Minas Gerais:** Caratinga, Est. Biol.

Figure 4. Holotype specimen of *Plinia longiacuminata* Sobral (*Carvalho et al. 6027*, CEPEC).

Caratinga, Mata do Jaó, *J. V. Gomes 1548* (BHCB), *F. Couto 86* (BHCB), *F. Couto 191* (BHCB, MO).

Plinia longiacuminata Sobral, sp. nov. TYPE: Brazil. Bahia: Uruçuca, Serra Grande, ca. 7.3 km na estrada Serra Grande–Itacaré, 14 July 1995, *A. M. de Carvalho, A. M. Amorim, J. G. Jardim, G. V. F. Pitanga & L. A. V. Carvalho 6027* (holotype, CEPEC; isotype, NY). Figures 1C, 4.

Haec species *Pliniae eduli* (Vellozo) Sobral proxima, sed ramunculis glabris et foliis angustioribus recedit.

Shrub to small tree 2–12 m; twigs gray, glabrous or occasionally with sparse erect brown trichomes 0.1–0.2 mm and sometimes bearing 2 to 5 series of widely to narrowly triangular cataphylls, the proximal ones 1 × 1 mm and the distal ones to 5 × 2–3 mm. Leaves petiolate; twigs slightly swollen at the insertion of the petioles, these 3–5 × 1 mm, glabrous or with scattered gray trichomes to 0.1 mm, blackened in dried specimens; blades narrowly lanceolate or oblong, 95–150 × 13–22 mm, discolored, drying dull green adaxially and slightly light brown abaxially; glandular dots scattered, to 0.1 mm diam., not visible on both sides, faintly visible against light; apex long-acuminate, the tip 15–35 mm; base cuneate; midvein plane or slightly impressed adaxially and salient abaxially; secondary veins in 20 to 25 pairs, scarcely visible on either side, occasionally faintly salient abaxially; intramarginal vein 1–1.5 mm from the sometimes revolute margin. Inflorescences ramiflorous, with up to 6 flowers, glomeruliform, fertile axis to 2 × 2 mm; bracts at base of inflorescences triangular, with scattered pale trichomes to 0.1 mm, in 3 to 4 series, the proximal ones 1 × 1 mm, the distal ones 6 × 4 mm; bracteoles triangular, to 2 × 2 mm, with white trichomes to 0.1 mm abaxially. Flower buds not seen; old flowers examined, these glabrous within and bearing white or gray trichomes 0.5–1 mm without; calyx lobes 4 or 5, irregularly triangular, 2–4 × 2.5–4 mm; petals not seen; stamens not seen; staminal ring 4 mm diam.; style 7–10 mm; calyx tube 2–2.5 mm deep; ovary 2-locular with 2 ovules per locule. Fruits globose to oblate, pale yellow to brownish yellow when ripe, to 35 × 45 mm, with persisting calyx lobes, 1-seeded; seeds ellipsoid to reniform, the embryo with 2 distinct plano-convex cotyledons and no evident hypocotyl.

Habitat, distribution, and phenology. Small tree from the coastal forests (mata atlântica) of the state of Bahia; presently it is known only from the municipalities of Una and Uruçuca in southern Bahia. Flowering material was collected in July, and fruiting material in February, April, May, July, and September to December.

Conservation status. The apparently restricted range of this species may be indicative of endemism, and it might be considered for inclusion under the IUCN category Vulnerable (VU) (IUCN, 2001), because it fits the IUCN criteria B2ab(iii), that is, area of occupancy estimated to be less than 20,000 km^2 (B2), distribution known to no more than 10 locations (B2a), and continuing decline of extent and/or quality of habitat, since coastal forests in southern Bahia are under constant anthropic pressure due to farming, cocoa plantations, and *Eucalyptus* forestation (B2b(iii)).

Affinities. *Plinia longiacuminata* is apparently related to *P. edulis* (Vellozo) Sobral (for description see Sobral, 2003: 149), another species from coastal Brazilian forests, from which it can be set apart by the characters in the following key couplet:

1a. Twigs, petioles, and midvein on both faces with dense indumentum of rufescent trichomes to 1 mm; blades 100–130 × 30–50 mm, the length:width ratio about 3:1; trees from coastal forests of Rio de Janeiro to Rio Grande do Sul, Brazil . . . . *Plinia edulis*

1b. Twigs glabrous or with scattered trichomes to 0.1–0.2 mm, petioles and blades glabrous; blades 95–150 × 13–22 mm, the length:width ratio at least 5:1; trees from coastal forests of Bahia, Brazil . . . . . *Plinia longiacuminata*

Etymology. The epithet alludes to the long-acuminate leaves of the species.

Paratypes. BRAZIL. **Bahia:** Uruçuca, 7.3 km N of Serra Grande, *A. M. de Carvalho, W. W. Thomas & T. S. dos Santos 3451* (CEPEC, NY), *A. M. Carvalho, W. W. Thomas & T. S. dos Santos 3543* (CEPEC, NY), *W. W. Thomas, A. M. de Carvalho, A. Amorim, S. Sant'Ana, J. G. Jardim & J. Gebhards 9166* (CEPEC, NY); 7.4 km N of Serra Grande, *W. W. Thomas, J. Pirani, J. Kallunki & I. Cordeiro 10333* (CEPEC, NY), *A. M. de Carvalho, W. W. Thomas, T. S. dos Santos, S. C. Sant'Ana & L. A. Mattos Silva 4403* (CEPEC, NY), *J. G. Jardim, A. M. de Carvalho, A. M. Amorim & S. C. Sant'Ana 426* (CEPEC, NY), *W. W. Thomas, A. M. de Carvalho, J. Jardim & G. Pitanga 11007* (CEPEC, NY); Una, Fazenda São Rafael, *L. A. Mattos Silva, J. B. Jorda Jr. & B. R. dos Santos 3890* (CEPEC).

Plinia subavenia Sobral, sp. nov. TYPE: Brazil. Bahia: Una, Res. Biol. do Mico-Leão, divisa da Faz. Maruim com Faz. Dois de Julho, 16 Sep. 1993, *S. C. Sant'Ana, A. M. Amorim, J. G. Jardim, E. B. dos Santos & A. G. Neto 365* (holotype, CEPEC; isotypes, MO, RB). Figures 1D, 5.

Haec species *Pliniae involucratae* (O. Berg) McVaugh proxima, a qua ramunculis glabris et venis centralibus adaxialiter sulcatis recedit.

Tree 4–20 m high; twigs pale brown, glabrous or with scattered white trichomes to 0.2 mm. Leaves with petioles 5–6 × 0.7–0.8 mm, glabrous or bearing trichomes as the twigs; blades glabrous or with scattered trichomes on the midvein, elliptic to lanceolate, sometimes oblong-elliptic, 45–70 × 15–20 mm, discolored, dull green adaxially and grayish green or brownish green abaxially, with glandular dots less than 0.1 mm diam., evident abaxially; apex long-acuminate, the acumen 6–18 mm; base cuneate to

Figure 5. Paratype specimen of *Plinia subavenia* Sobral (*Fernandes et al. 2907*, BHCB).

attenuate; midvein sulcate and frequently with scattered white trichomes to 0.1 mm adaxially, salient and rarely with sparse trichomes to 1 mm abaxially; secondary veins in 10 to 16 pairs, scarcely visible adaxially, visible and faintly salient abaxially; intramarginal vein 0.5–1.5 mm from the markedly revolute margin, occasionally a submarginal vein (sensu Carr et al., 1986: 61) to 0.3 mm. Inflorescences as axillary glomerules, the fertile axes to 1 × 1.5 mm, each bearing 2 to 4 flowers;

bracts hemispheric, 0.8–1 × 1–1.5 mm, with cilia to 0.1 mm; pedicels absent; bracteoles elliptic, 2 × 1.2–1.5 mm, keeled, with trichomes 0.2 mm along the keel. Flower buds not seen; flowers with white trichomes to 0.2 mm on the ovary, the indumentum becoming sparse along the calyx tube and absent on the abaxial side of the calyx lobes, these 4 to 6, 1–2 × 1–2 mm, irregular and partially tearing the 1-mm-deep calyx tube at anthesis; stamens not seen; staminal ring to 2 mm, glabrous; petals not seen; style 5 mm, the stigma punctiform; ovary 2-locular, with 2 ovules per locule. Fruits oblate, yellow when ripe, 9–12 × 14–15 mm, with scattered white trichomes, 1-seeded; seeds ellipsoid, 12 × 7–8 mm; embryo glandular-dotted, with 2 distinct plano-convex cotyledons and no evident hypocotyl.

Habitat, distribution, and phenology. *Plinia subarenia* is a tree from coastal Brazilian forests (mata atlântica), occurring at altitudes from sea level to 900 m; it is presently known from only two localities in Bahia and Espírito Santo, some 700 km apart from each other. Curiously, it has not yet been collected at any site along the 700 km that separate these localities. Flowering material was collected in September and fruiting material in March and September.

Conservation status. *Plinia subarenia* presents a considerably wide geographical distribution, and presently it does not fit any of the necessary IUCN criteria to be included in any of the risk categories (critically endangered, endangered, or vulnerable; IUCN, 2001). Nevertheless, considering its occurrence in the area of the central corridor of the Atlantic forest (Aguiar et al., 2005) and the intense pressure that still exists on forest fragments along this corridor (Aguiar et al., 2005; Young, 2005), this species can be considered in the category of Near Threatened (NT; IUCN 2001), a category for species close to qualifying for a threatened category in the near future, depending on developmental policies in the region.

Affinities. *Plinia subarenia* is apparently related to *P. involucrata* (O. Berg) McVaugh (for a description see McVaugh, 1958: 779 [as *Plinia pinnata* L.] and McVaugh, 1969: 228), an Amazonian species, from which it can be set apart by the following couplet:

1a. Branches and petioles villous-tomentose with trichomes to 1 mm; blades with midvein flat or raised adaxially and abaxial face with erect yellow trichomes; bracts to 2.5 mm, bracteoles to 4 mm, silky; flowers entirely pilose externally; fruits with velutinous brown trichomes; Amazonian Brazil, Peru, and Venezuela . . . . . *Plinia involucrata*

1b. Branches and petioles glabrous or with scattered trichomes to 0.2 mm; blades with midvein impressed adaxially and abaxial face glabrous or with scarce, loosely appressed white trichomes; bracts to 1 mm, bracteoles to 2 mm, with trichomes restricted to the keel; flowers externally pilose only at the ovary; fruits with sparse white trichomes; eastern Brazilian forests . . *Plinia subarenia*

Etymology. The epithet is derived from the Latin word for almost veinless, alluding to the scarcely visible venation of the leaf blades.

Paratype. BRAZIL. **Espírito Santo:** Santa Teresa, Valsugana Velha, Est. Biol. de Santa Teresa, *H. Q. Boudet Fernandes, W. Boone & W. Pizziolo 2907* (BHCB, MBML).

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Literature Cited

Aguiar, A. P., A. G. Chiarello, S. L. Mendes & E. N. Matos. 2005. Os corredores central e da Serra do Mar na Mata Atlântica brasileira. Pp. 119–132 *in* C. Galindo-Leal & I. G. Câmara (editors), Mata Atlântica. Biodiversidade, Ameaças e Perspectivas. Fundação SOS Mata Atlântica, Belo Horizonte.

Amshoff, G. J. H. 1951. Myrtaceae. Pp. 56–158 *in* A. A. Pulle (editor), Flora of Suriname, Vol. 3, Part 2.

Briggs, B. G. & L. A. S. Johnson. 1979. Evolution in the Myrtaceae—Evidence from the inflorescence structure. Proc. Linn. Soc. New South Wales 102: 157–256.

Carr, D. J., S. G. M. Carr & J. R. Lenz. 1986. Leaf venation in *Eucalyptus* and other genera of Myrtaceae: Implications for systems of classification of venation. Austral. J. Bot. 34: 53–62.

Holst, B. K. & M. L. Kawasaki. 2004. New species of *Calyptranthes* and *Myrcia* (Myrtaceae) from Central America. Selbyana 25: 87–100.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.

Kawasaki, M. L. 1989. Flora da Serra do Cipó, Minas Gerais: Myrtaceae. Bol. Bot. Univ. São Paulo 11: 121–160.

Kiaerskou, H. 1893. Enumeratio myrtacearum brasiliensium. Pp. 1–199 *in* E. Warming (editor), Symbolarum ad floram Brasiliae Centralis cognoscendam 39.

Landrum, L. R. 1986. *Campomanesia, Pimenta, Blepharocalyx, Legrandia, Acca, Myrrhinium* and *Luma*. Flora Neotropica 45: 1–178.

———. 2003. A revision of the *Psidium salutare* complex. Sida 20: 1449–1469.

——— & M. L. Kawasaki. 1997. The genera of Myrtaceae in Brazil: An illustrated synoptic treatment and identification keys. Brittonia 49: 508–536.

McVaugh, R. 1958. Flora of Peru—Myrtaceae. Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 569–818.

———. 1969. Flora of the Guayana Highland—Myrtaceae. Mem. New York Bot. Gard. 18: 55–286.

Neto, L., V. Almeida & R. Forzza. 2004. A família Orchidaceae na Reserva Biológica da Represa do Grama—Descoberto, Minas Gerais, Brasil. Rodriguésia 55: 137–156.

Proença, C. E. B. 1990. A revision of *Siphoneugena*. Edinburgh J. Bot. 17: 239–271.

Snow, N., G. Guymer & G. Sawvel. 2003. Systematics of *Austromyrtus*, *Lenwebbia*, and the Australian species of *Gossia* (Myrtaceae). Syst. Bot. Monogr. 65: 1–95.

Sobral, M. 1993. Sinopse de *Myrciaria* (Myrtaceae). Napaea 9: 13–41.

———. 2003. A família Myrtaceae no Rio Grande do Sul. Editora Unisinos, São Leopoldo.

Young, C. E. F. 2005. Causas socioeconômicas do desmatamento da mata atlântica brasileira. Pp. 103–118 *in* C. Galindo-Leal & I. G. Câmara (editors), Mata Atlântica. Biodiversidade, Ameaças e Perspectivas. Fundação SOS Mata Atlântica, Belo Horizonte.

Wilson, P. G., M. M. O'Brien, P. A. Gadek & C. J. Quinn. 2001. Myrtaceae revisited: A reassessment of infrafamilial groups. Amer. J. Bot. 88: 2013–2025.

Siphoneugena delicata (Myrtaceae), a New Species from the Montane Atlantic Forests of Southeastern Brazil

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Abstract. *Siphoneugena delicata* Sobral & Proença (Myrtaceae), from the montane Atlantic forests of the Brazilian states of Espírito Santo and Minas Gerais, is described and illustrated. The new species is related to *S. guilfoyleiana* Proença, known until now only from the restinga vegetation in the state of São Paulo, and *S. reitzii* D. Legrand, from montane habitats from southern Brazil. It is distinguished from both by the shrubby habit, smaller leaves to 12 mm long with the midvein plane or sulcate adaxially, and clearly apiculate flower buds. Additionally, it is set apart from *S. guilfoyleiana* by the puberulous branches and deciduous bracteoles and from *S. reitzii* by the markedly rugose bark.

Resumo. *Siphoneugena delicata* Sobral & Proença (Myrtaceae), da floresta ombrófila altomontana dos estados de Espírito Santo e Minas Gerais, é descrita, ilustrada e comparada com *S. guilfoyleiana* Proença, conhecida somente para a restinga do estado de São Paulo, e *S. reitzii* D. Legrand, da floresta ombrófila montana do sul do Brasil. *S. delicata* se distingue de ambas pelo hábito arbustivo, folhas menores (até 12 mm de comprimento) com a nervura central sulcada ou plana na face adaxial e botões florais marcadamente apiculados. Além disso, separa-se de *S. guilfoyleiana* pelos ramos pubérulos e bractéolas decíduas e de *S. reitzii* pelo córtex rugoso.

Key words: Brazil, IUCN Conservation Status, Myrtaceae, *Siphoneugena*.

Siphoneugena O. Berg is an American genus recently revised by Proença (1990), who recognized eight species ranging from the Antilles to the southernmost Brazilian state of Rio Grande do Sul, five of them growing in montane habitats at least 900 m above sea level, two at lower altitudes, and one in coastal scrubby forest (restinga). The genus can be recognized by flowers bearing an evident hypanthium that is constricted above the ovary and falls as an entire piece after anthesis, ovary two-celled with more than two ovules per locule, fruits with a circular scar instead of calyx lobes, and seeds with two plano-convex cotyledons and hypocotyl not evident (Proença, 1990). Among recent collections in the mountainous massif along the border of the southeastern Brazilian states of Espírito Santo and Minas Gerais, we have found a small-leaved species of *Siphoneugena* that we consider as new and describe herein.

Siphoneugena delicata Sobral & Proença, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, Lombardia, Res. Biol. Augusto Ruschi, 19 Sep. 2001, *L. Kollmann, W. Pizziolo & E. Bausen 1663* (holotype, MBML; isotypes, BHCB, MBM, UB). Figures 1, 2.

Species haec *S. guilfoyleianae* et *S. reitzii* proxima: a prima ramulis pilosis, foliis minoribus, alabastris apiculatis et bracteolis deciduis, altera habito fruticoso, cortice forte rugoso, foliis nervis centralibus supra planis vel sulcatis et alabastris apiculatis distincta est.

Shrub or treelet to 3 m high; bark rugose; plants glabrous except for twigs and internal side of calyx lobes with curled white trichomes ca. 0.1 mm. Leaves elliptic or elliptic-obovate, 8–12 × 5–8 mm, occasionally slightly discolorous in dried material, with translucid glands generally visible on the abaxial side as dark dots to 0.1 mm diam.; apex widely acute or rounded; base widely cuneate; midvein plane to slightly sulcate adaxially and abaxially prominent at least to the middle of blade and then diminishing distally; secondary veins 5 or 6 pairs, generally invisible on both faces, occasionally faintly visible adaxially; marginal vein continuous, hardly visible, to 0.3 mm from the margin, the margin itself strongly revolute; petioles 0.7–1 × 0.4–0.5 mm, occasionally with scattered white trichomes as the twigs. Flowers 1 or 2, solitary or paired, mostly 2, axillary or ramiflorous, at the apex of a small peduncle to

Figure 1. *Siphoneugena delicata* Sobral & Proença. Unmounted isotype at BHCB (*Kollmann et al. 4663*).

0.5 × 0.3 mm, the peduncle sometimes with hemispheric bracts to 0.2 × 0.2 mm; pedicels 0.8–1 × 0.2–0.3 mm; bracteoles rounded or widely triangular, 0.2–0.3 × 0.3 mm, deciduous at or before anthesis, occasionally with 2 lateral glandular setae to 0.2 mm at their bases; flower buds spindle-shaped, 4–5 × 2 mm, apically closed, bearing an apiculum 0.4–0.5 mm, this occasionally crowned with a tuft of trichomes to 0.1 mm; calyx opening by tearing in 3 to 4 lobes of irregular shapes, mostly ± rounded or elliptic-rounded and 1.5–1.8 × 1.2–2 mm, the lobes internally with scattered white trichomes to 0.1 mm, sometimes the fragment that bears the apiculum markedly larger than the others and calyptrate, 1.5–1.8 mm diam.; petals 3 or 4, attached to the calyx lobes, spathulate, 1.5 × 0.5–1 mm, with trichomes as the calyx lobes; stamens about 80, 5 mm long, the anthers globose, 0.3–0.4 × 0.3 mm, with 1 apical gland; hypanthium to 2 mm deep, circumcissile at anthesis; style 5–6 mm, the stigma punctiform; ovary

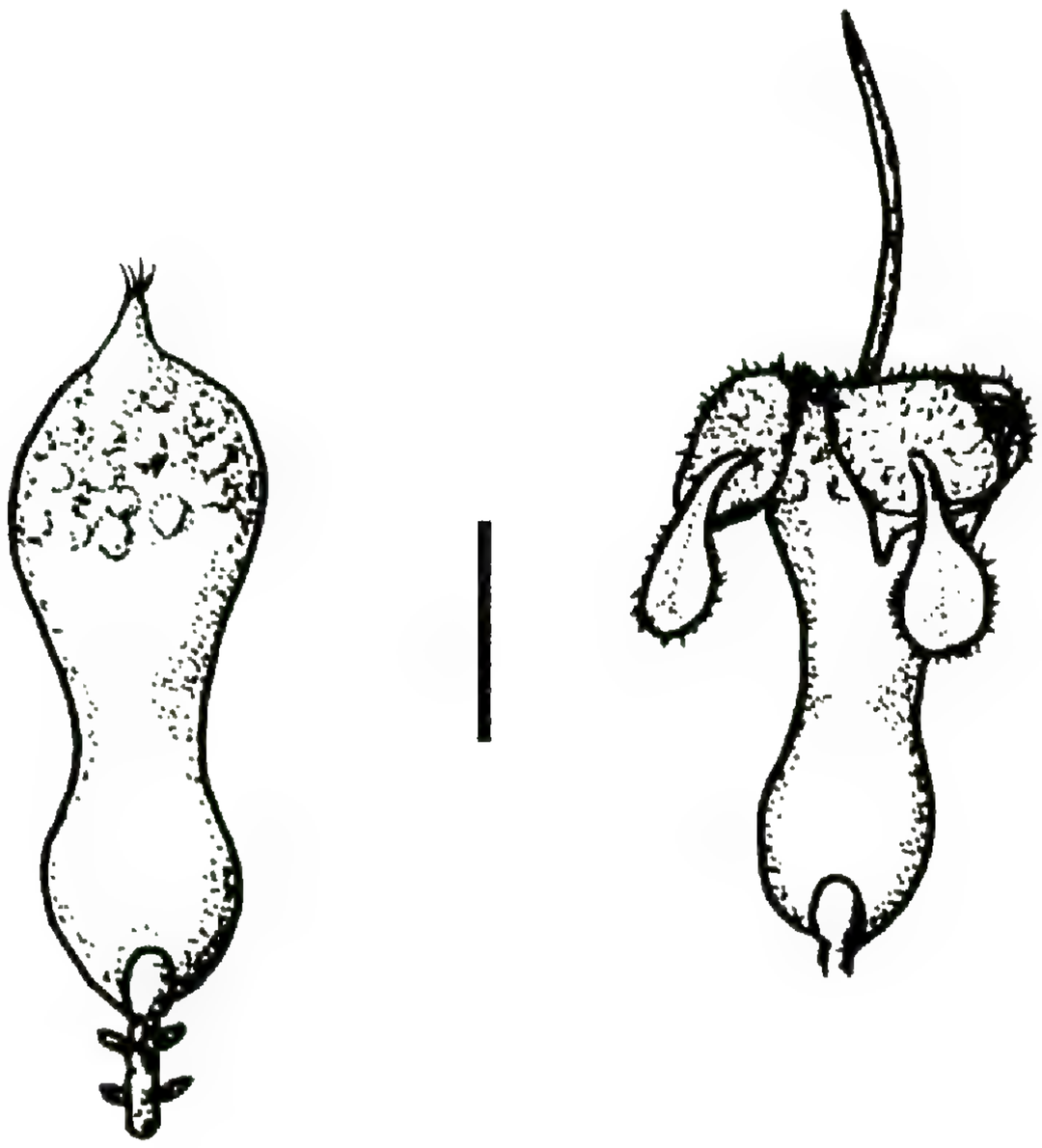

Figure 2. *Siphoneugena delicata* Sobral & Proença. Schematic drawing of flower bud (left) and flower after anthesis (right) (both from *Kollmann et al. 4663*, isotype, BHCB). Scale bar = 2 mm.

bilocular with 2 to 4 centrally attached ovules by locule. Fruits globose, to 5 mm diam., vinaceous when ripe, 1- to 2-seeded; seeds reniform, 4 × 2–3 mm; mature embryo not examined.

Distribution, habitat, and phenology. *Siphoneugena delicata* is a shrub or treelet principally at forest edges at altitudes from 800 to 2100 m above sea level. It has been collected in humid montane forests in the municipality of Santa Teresa, in the state of Espírito Santo, and in the Serra do Caparaó National Park, near the border of the states of Espírito Santo and Minas Gerais, in places where forest formations are presently highly fragmented due to human activities such as farming and timber exploration. Flowering material was collected in September and fruiting material in September and October.

Conservation status. Collection sites of *Siphoneugena delicata* are mostly 100 km apart from each other, the scarcity of collections allows us to consider its area of occupancy to be smaller than 20,000 km^2 (criterion B2), it is known from no more than 10 locations (B2a), and its habitat presents a continuing decline of extent and/or quality (B2b(iii)) because land clearing for farming and timber exploration are still causes of environmental impact on the Atlantic forest (Aguiar et al., 2005). Based on this evidence and evaluating this species according to the criteria proposed by IUCN (2001), *S. delicata* could fit the category Vulnerable (VU), through the criteria B2ab(iii).

Affinities. This species is related to *Siphoneugena guilfoyleiana* Proença, from which it can be distinguished by the following couplet:

1a. Tree to 12 m; twigs glabrous; leaves 30–50 × 11–26 mm; petioles 2–3 × 1.5 mm; midvein raised on both surfaces; bracteoles to 1 mm, persisting after anthesis; flower bud with an apical pore, not apiculate; stamens about 140; restingas of São Paulo . . . . . *S. guilfoyleiana*

1b. Shrub or treelet to 3 m; twigs with trichomes to 0.1 mm; leaves 8–12 × 3–8 mm; petioles 1 × 0.5 mm; midvein flat or slightly sulcate adaxially; bracteoles to 0.3 mm, deciduous at or before anthesis; flower buds clearly apiculate; stamens about 80; montane Atlantic forests from Espírito Santo and Minas Gerais . . . . . *S. delicata*

Additionally, *Siphoneugena delicata* can sometimes be confused with small-leaved forms of *S. reitzii* D. Legrand, another species from montane habitats of southern Brazil; nevertheless, *S. reitzii* is a tree to 15 m high with smooth and exfoliating bark, with blades with the midvein raised on both surfaces and flower buds with four clearly visible lobes that open regularly at anthesis. In the collection sites, *S. delicata* is sympatric with two additional species of *Siphoneugena*, *S. dussii* (Krug & Urban) Proença and *S. kiaerskoviana* (Burret) Kausel; nevertheless, both species can be readily distinguished by their larger leaves (30–90 mm long) and flowers with four evident calyx lobes.

Etymology. The epithet *delicata* alludes to the small leaves and habit of this species relative to those of its congeners.

Paratypes. BRAZIL. **Espírito Santo:** Santa Teresa, *M. Sobral & H. Boudet Fernandes 9440* (BHCB, MBM, MO); *J. Rossini & E. Bausen 553* (MBML). **Minas Gerais:** Alto Caparaó, Vale Encantado, *L. Leoni 4015* (ESA, GFJP).

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Literature Cited

Aguiar, A. P., A. G. Chiarello, S. L. Mendes & E. N. Matos. 2005. Os corredores central e da Serra do Mar na Mata Atlântica brasileira. Pp. 119–132 *in* C. Galindo-Leal & I. G. Câmara (editors), Mata Atlântica. Biodiversidade, Ameaças e Perspectivas. Fundação SOS Mata Atlântica, Belo Horizonte.

IUCN. 2001. IUCN Red List Categories and Criteria Version 3.1. IUCN Species Survival Commission, IUCN, Gland, Switzerland, and Cambridge, United Kingdom.

Proença, C. 1990. A revision of *Siphoneugena* Berg. Edinburgh J. Bot. 47: 239–271.

Two New Species of *Bauhinia* (Fabaceae, Caesalpinioideae, Cercideae) from Southeastern Mexico and Mesoamerica

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Abstract. Two new species of *Bauhinia* L. (Fabaceae, Caesalpinioideae, Cercideae) are described and illustrated: *B. miriamae* R. Torres endemic to Oaxaca, and *B. wunderlinii* R. Torres from México, Belize, and Honduras. Similarities to and differences from *B. divaricata* L. are discussed for both species; all three belong to section *Bauhinia*. With these novelties, *Bauhinia* sect. *Bauhinia* comprises approximately 20 species and is most diverse in Mexico, where there are 19 native and 14 endemic species.

Resumen. Se describen e ilustran dos especies de *Bauhinia* (Fabaceae, Caesalpinioideae, Cercideae): *B. miriamae* R. Torres endémica de Oaxaca y *B. wunderlinii* R. Torres de México, Belice y Honduras. Se discuten similaridades y diferencias morfológicas de ambas especies con *B. divaricata* L., considerando a las tres en la sección *Bauhinia*. Con estas novedades, *Bauhinia* sect. *Bauhinia* contiene aproximadamente 20 especies, siendo México un centro de diversidad importante para este grupo con 19 especies nativas, de las cuales 14 son endémicas a este país.

Key words: *Bauhinia*, Fabaceae, Mesoamerica, Mexico, section *Bauhinia*.

During the taxonomic revision of *Bauhinia* L. (Fabaceae, Caesalpinioideae, Cercideae) for Mesoamerica (Torres, 1999), three new species were discerned, one of *Bauhinia* sect. *Amaria* (S. Mutis ex Caldas) Endlicher (Torres, 2001) and two here described of section *Bauhinia* (according to classification of Wunderlin et al., 1987). *Bauhinia miriamae* R. Torres has the calyx spathaceous, five unguiculate and lanceolate petals, and a diadelphous androecium with one perfect stamen and biseriate, connate staminodes. It is related to *B. divaricata* L., differing notably from this species in its pubescence, number of leaf primary veins, the color and other aspects of the floral rachis and flowers, claw petal size, and the shape of the hypanthium and staminodes. Likewise, *B. wunderlinii* R. Torres is also morphologically similar to *B. divaricata*, differing notably from it by its arborescent habit, shape of the leaves and number of primary veins, and size of the calyx, stamens, and gynoecium. In addition, *B. wunderlinii* has uniseriate staminodes, while *B. divaricata* has biseriate staminodes that differ in shape from *B. wunderlinii*.

Bauhinia miriamae R. Torres, sp. nov. TYPE: Mexico. Oaxaca: Distr. de Tuxtepec, mpio. de San Miguel Soyaltepec, camino al vertedor de La Presa Miguel Alemán (Temascal), 10 Dic. 1993, *Rafael Torres C. 14334* (holotype, MEXU; isotypes, ENCB, MEXU, MO, NY, OAX, USF). Figure 1.

Frutex 1–2 m, caulibus juvenibus dense minuteque hirsuto-ferrugineis; folia 7- ad 9-nervia, nervis minute hirsuto-ferrugineis, utrimque villosa, stipulis minute hirsutis. Inflorescentiae rhachidi minute hirsuto-ferrugineo, alabastris et pedicellis rubris, minute hirsutis. Flores pendentes: hypanthium urceolatum, rubrum, minute hirsutum; calyx ruber, minute hirsutus; petala breviunguiculata; staminodia 9, in 2 seriebus: 5 vel 6 per totam longitudinem connata, laminam conduplicatam formantia; 4 vel 3 ad superficiem externam laminae, per 2/3 longitudinem filamentorum affixa; ovarium minute hirsutum vel tomentosum, ferrugineum. Legumen oblanceolatum. A *Bauhinia divaricata* differt indumento minute hirsuto-ferrugineo, nervis foliorum magis numerosis, calyce rubro, floribus pendentibus et staminodiis omnino connatis.

Shrub 1–2 m high, andromonoecious; young branches densely and minutely hirsute-ferruginous, old branches glabrous. Leaves (1.5–)3–10(–13) × (1.4–)2–5(–6.5) cm, apically 2-lobed, bilobed for 1/3 length, lobes divaricate, blade widely ovate, chartaceous, 7- to 9-veined, veins finely hirsute-ferruginous, upper and lower surface villous, apex of lobes acute, base cordate to rounded; stipules (0.9–)1.5–3.2 × 0.2–1.1 mm, lanceolate, minutely hirsute, intrastipular excrescence ca. 1.5 mm, narrowly oblong; petiole (1–)1.5–3.2(–4.1) cm, canaliculate, minutely hirsute to villous-ferruginous. Inflorescences racemose, 10- to 30-flowered, terminal or rarely cauliflorous; rachis minutely hirsute-ferruginous; floral buds ca. 1.5 × ca. 0.4 cm, falcate, red, minutely hirsute; bracts 1–2 (–2.9) × ca. 0.3 mm, linear-lanceolate, minutely hirsute; bracteoles 0.8–1.5 × ca. 0.1 mm, linear, minutely hirsute; pedicels 1–2.5 cm, articulate at apex, red, minutely hirsute, persistent. Perfect

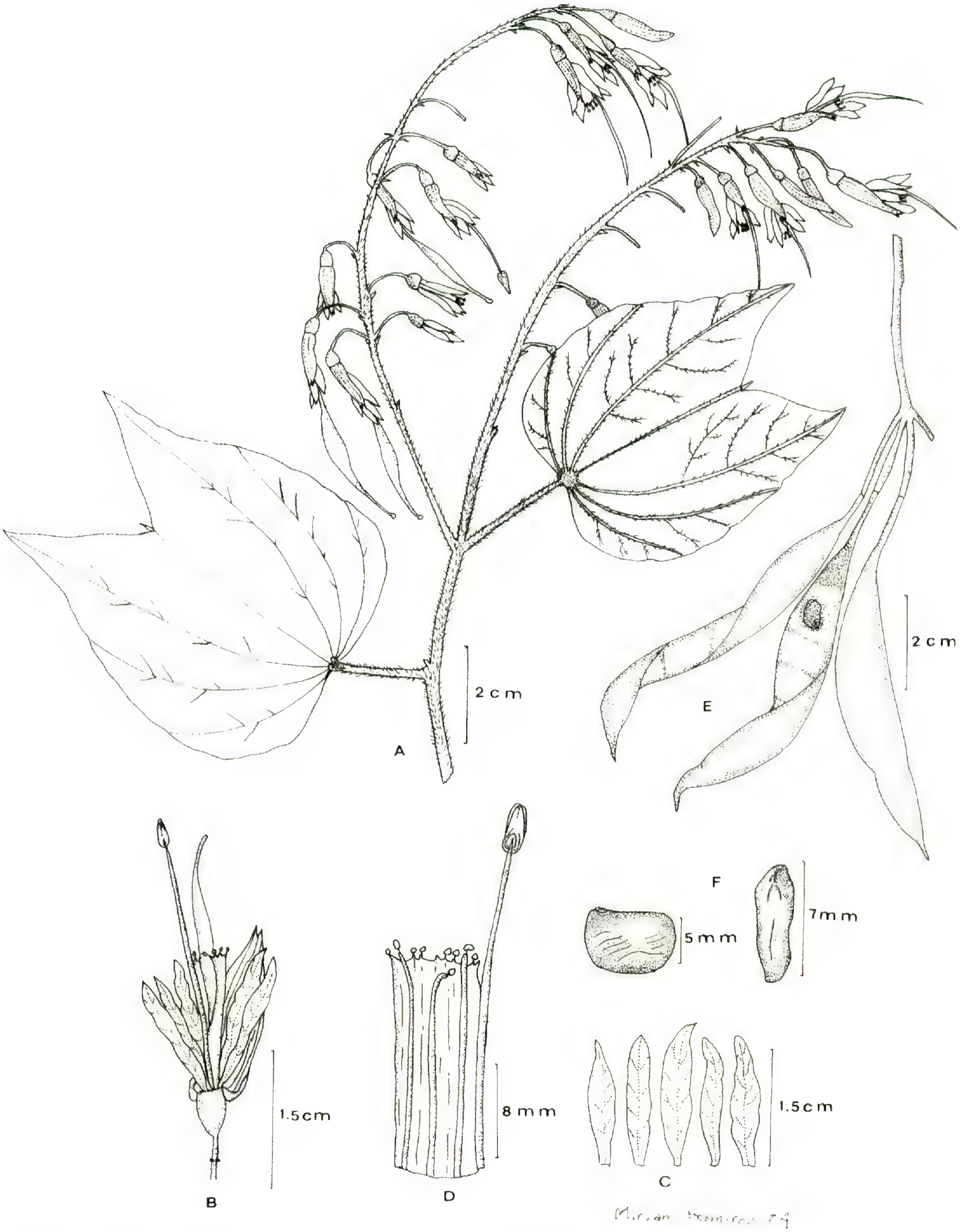

Figure 1. *Bauhinia miriamae* R. Torres. —A. Branch with inflorescences. —B. Hermaphroditic flower. —C. Petals. —D. Androecium with staminodes, dorsal view. —E. Dehiscent legumes. —F. Seed, lateral and ventral view. (A, B, C, D based on *Torres 1604*, MEXU; E and F based on *Torres 1094*, MEXU.)

flowers, pendulous; hypanthium 2–1.5 × 1.1–2.7 mm, urceolate, red, minutely hirsute, caducous; calyx 0.8–1.3 × 0.2–0.5 cm, spathaceous at anthesis, with 2 or 3 basal apertures, 5-lobed, red, minutely hirsute, lobes 0.5–1 mm, filiform, minutely hirsute; petals 5, subequal, 1–2.2 cm, imbricate, white, ruddy with age, lamina 0.8–2 × 0.2–0.5 cm, lanceolate, claw 1–2 mm, glabrous; androecium diadelphous, fertile stamen 1, ca. 3 cm, slightly arcuate, connate almost 1/2 their length with 9 staminodes; anther 3–

Table 1. Data comparing the new species *Bauhinia miriamae* and *B. wunderlinii* with *B. divaricata*.

Characters	*B. divaricata*	*B. miriamae*	*B. wunderlinii*
Habit	Shrub	Shrub	Tree, rarely shrub
Pubescence	Minutely strigose	Minutely hirsute-ferruginous	Minutely strigose
Leaf primary veins	5 to 7	7 to 9	8 to 9
Flower position	Erect	Pendulous	Erect
Hypanthium	Cyathiform	Urceolate	Cyathiform
Calyx length, cm	1–1.5	0.8–1.3	0.6–0.8
Claw petal length, mm	5–8	1–2	3–6
Stamen length, cm	2.9–4.6	ca. 3	1.8–2.4
Staminodes length, cm	1–1.9	1–1.6	0.6–0.8
Staminodes position	Biseriate	Biseriate	Uniseriate
Staminodes connation	2/3 their length	Full-connated	2/3 their length
Gynoecium length, cm	3.7–6.2	2–3	0.7–1.4

4.5 × ca. 1.5 mm, narrowly elliptic; staminodes 1–1.6 × ca. 0.4 cm, biseriate; 5 to 6 fully connated, on conduplicate blade, lobes ca. 0.5 mm, irregularly triangular, 4 or 3 adnate on blade adaxial surface 2/3 their length, staminode anthers poorly developed, persistent; gynoecium 2–3 cm, slightly arcuate, ovary long-stipitate, finely hirsute to tomentose, ferruginous, stigma ca. 0.3 mm diam., clavate, oblique; male flowers similar. Legume 3.5–8.5(–10.1) × ca. 1.5 cm, oblanceolate, sublignous, elastically dehiscent, brown, glabrous to scarcely strigulose, apiculate with persistent style ca. 5 mm, stipe ca. 1.5 cm; seeds 5.5–7.5 × ca. 5.5 mm, elliptic to oblong, dark brown, aril lobes short, hilum subapical.

Distribution and habitat. *Bauhinia miriamae* is endemic to Temascal in the Tuxtepec region (basin of Papaloapan river, Oaxaca). The new species occurs in tropical evergreen forest between 50 and 130 m.

Phenology. Flowering October–March; fruiting January–June.

Bauhinia miriamae is morphologically similar to species of section and series *Bauhinia* and is similar and close to *B. divaricata*. It differs by the minutely hirsute-ferruginous indumentum of almost the entire plant, by the 7 to 9 primary veins on the leaf blades, and the distinctive reddish color on the inflorescences rachis, pedicels, hypanthium, and calyx. The hypanthium is urceolate, its flowers are pendulous, the petals are shortly unguiculate, and the adaxial staminodes always are almost totally connate with persistent and immature anthers on short triangular lobes. *Bauhinia divaricata* has a fine strigose indumentum, 5 to 7 primary veins on the leaf blades, and a greenish color on the inflorescence rachis, pedicels, hypanthium, and calyx. The hypanthium is cyathiform, its flowers are erect, and the petals conspicuously unguiculate. The adaxial staminodes are connate for 2/3 their length, with long-linear lobes, without developed anthers (Table 1).

Etymology. This species epithet is dedicated to Miriam P. Ramírez De Anda, biologist and botanical illustrator, for her unlimited support and contribution to the taxonomic study of *Bauhinia* through her various drawings and constructive morphological observations (including those herein illustrated).

Paratypes. MEXICO. **Oaxaca:** Distr. Tuxtepec, Mpio. de San Miguel Soyaltepec, 2 km de la Hidroeléctrica al vertedor de La Presa Temascal, *Luis Cortés A. 613, R. Torres & M. P. Ramírez* (MEXU), *Luis Cortés A. 1176 & R. Torres* (MEXU); 3 km al S de Temascal, *A. García 2750, L. Cortés & M. L. Torres* (MEXU); 2 km al E de Temascal, *E. Martínez 24033 & C. H. Ramos* (MEXU), *C. H. Ramos 400 bis & E. Martínez* (MEXU); Camino al Vertedor, ca. 5 km de la Cortina, 17 oct. 1987, *C. H. Ramos s.n.* (MEXU); Nueva Patria, a 2 km sobre el camino, *O. Téllez 364, Ph. Lamy & A. Romo* (MEXU); La Curva del Diablo, camino al Vertedor, 4 km al SE de Temascal, *Rafael Torres C. 9691, 9692 & 9693, L. Cortés, M. Sousa & G. Andrade* (MEXU), *Rafael Torres C. 16042, 16043, 16044 & J. C. Montero* (MEXU); 5.7 km al S de Temascal, camino al vertedor, *Rafael Torres C. 10944, L. Cortés y E. Martínez* (MEXU).

Bauhinia wunderlinii R. Torres sp. nov. TYPE: Mexico. Veracruz: Mpio. de Minatitlán, 13.7 km al E de La Laguna, terracería a Uxpanapa, luego 6.5–7 km al N sobre camino nuevo (no completo) a Belisario Domínguez (brecha 93), 130 m, 28 Apr. 1982, *Thomas L. Wendt 3905, A. Villalobos, I. Navarrete & A. García* (holotype, MEXU; isotypes, CHAPA, TEX). Figure 2.

Arbor 13–20 m alta, raro frutex; folia 8- ad 9-nervia, lobis leviter divergentibus vel convergentibus, lamina late ovata, apice lobis acutis vel apiculatis; calyx 0.6–0.8 cm longus, ca. 0.4 cm latus, spathaceus, flavidus, minute tomentosus, trichomatibus incrassatis, adpressis, brunneo-rubellis; petala unguiculata, 0.7–1.4 cm longa; stamen fertile, 1.8–2.4 cm longum; staminodia 9, uniseriata, 0.6–0.8 cm longa, 0.2–0.4 cm lata, per 2/3 longitudinem connata, carnosa, pilosa, conduplicata, tubum formantia; gynoecium 0.7–1.4 cm longum, ovario vix minute tomentoso. A *Bauhinia divaricata* differt habito arboreo, nervis foliorum magis numerosis, lobis

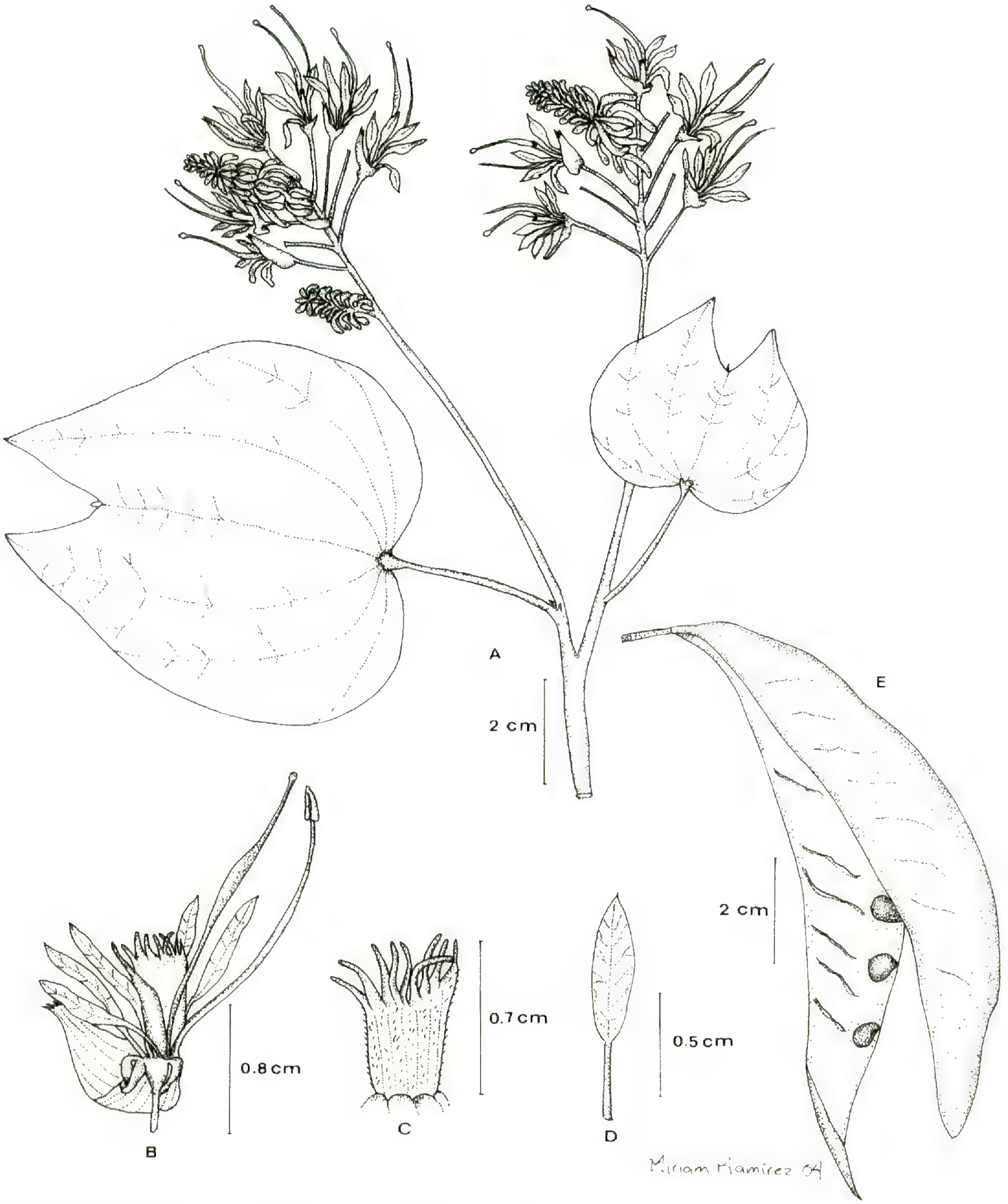

Figure 2. *Bauhinia wunderlinii* R. Torres. —A. Branch with inflorescences. —B. Hermaphroditic flower. —C. Staminodes, dorsal view. —D. Petal. —E. Dehiscent legume with immature seeds. (A based on *Whitefoord 9532*, MEXU, fewer flowers were drawn; B, C, and D based on *Davidse 34360*, *MEXU*; E based on *Hernández 3242*, MEXU.)

foliorum parallelis vel convergentibus, calyce breviore et staminodiis uniseriatis.

Tree 13–20 m high, rarely shrubs, young branches minutely strigose, old branches glabrous to minutely strigose. Leaves (7.1–)10–12.4 × (4.5–)6.4–9(–10.3) cm, apically 2-lobed, bilobate for 1/3 length, lobes slightly divergent or convergent, blade widely ovate, chartaceous, 8- to 9-veined, upper and lower surface glabrous, apex of lobes acute to apiculate, base truncate to cordate; stipules ca. 1.5 × ca. 1 mm, triangular, minutely strigose, intrastipular excrescence ca. 1 mm, lanceolate; petioles 2–4 cm, slightly canaliculate, glabrous to minutely strigose. Inflorescences racemose, with more than 50 flowers congested distally (strobilus-like), terminal and subterminal; rachis minutely strigose, brown to greenish brown;

floral buds 0.7–1 × ca. 0.3 cm, green to yellowish green, minutely tomentose, with thickened-adpressed, brown to reddish brown trichomes; bracts (0.5–) 1–2 × 0.5–1 mm, triangular to lanceolate, minutely strigose; bracteoles 0.5–1.2 × ca. 0.5 mm, triangular to lanceolate, minutely strigose; pedicels 0.9–1.3 cm, articulate in the apex, yellowish green, minutely strigulose, persistent. Perfect flowers, erect: hypanthium 3–3.5(–4) × 1–1.5 mm, cyathiform, yellowish green, minutely strigose; calyx 0.6–0.8 × ca. 0.4 cm, spathaceous at anthesis, yellowish green, minutely tomentose, with thickened-adpressed, brown to reddish brown trichomes, inconspicuously 5-lobed, lobes 0.1–0.8 mm, triangular; petals 5, 0.7–1.4 cm, white at anthesis, slightly pink in age, conspicuously unguiculate, claw 3–6 mm, glabrous, blade 0.4–0.8 × ca. 0.2 cm, lanceolate, glabrous; androecium diadelphous, fertile stamen 1, 1.8–2.4 cm, straight, connate almost in the base with 9 staminodes; anthers ca. 3 × ca. 1.2 mm, lanceolate, glabrous; staminodes 0.6–0.8 × 0.2–0.4 cm, uniseriate, connate for 2/3 length, on conduplicate blade, fleshy, pilose, lobes 1–2 mm, triangular to linear, staminode anther not developed, caducous; gynoecium 0.7–1.4 cm, slightly arcuate, ovary long-stipitate, minutely hirsute to minutely tomentose, stigma ca. 0.4 mm diam., capitate; male flowers similar. Legume (immature) ca. 12 × ca. 2 cm, narrowly oblong, sublignous, dehiscent, brown, glabrous to minutely strigose; stipe ca. 1 cm, rostrum ca. 3 mm; mature seeds not seen.

Distribution and habitat. *Bauhinia wunderlinii* is restricted in Mesoamerica with distribution in Chiapas, Veracruz, Belize, and Honduras, occurring in tropical ombrophilous forests or tropical evergreen forest between 130 and 610 m.

Phenology. Flowering April–June; fruiting July.

Bauhinia wunderlinii is morphologically similar to *B. divaricata* by having racemose inflorescences with more than 50 flowers, with five white petals (slightly pink at maturity) with blades lanceolate and conspicuously unguiculate; the androecium is diadelphous with one stamen perfect and nine connate staminodes on a conduplicate blade. *Bauhinia wunderlinii* may be distinguished from *B. divaricata* by its leaves widely ovate with lobes slightly divergent to convergent and 8- to 9-nerved, calyx shorter and finely tomentose, and shorter fertile stamen and gynoecium. Also, the staminodes are shorter, uniseriate, and connate for 2/3 their length with short triangular-linear lobes. In *B. divaricata* the leaves are ovate to lanceolate with lobes divaricate and 5- to 7-nerved, and the calyx (1–1.5 cm, minutely strigose), petals (1.5–2.5 cm), fertile stamen (2.9–4.6 cm), gynoecium (3.7–6.2 cm), and staminodes (1–1.9 cm) are longer. The staminodes are biseriate, and six are connate for 2/3 their length, like a conduplicate blade with long linear lobes; three are adnate to the adaxial surface of the conduplicate blade for 1/2 their length (Table 1).

Etymology. This species is named in honor of Richard P. Wunderlin, who has made an important contribution to the taxonomy of *Bauhinia*, particularly in the reorganization of the tribe Cercideae.

Paratypes. BELIZE. Cayo Distr., Millinario to Las Cuevas road, *C. Whitefoord 9532* (MEXU). HONDURAS. **Comayagua:** Lago Yojoa, southern end of Lago Yojoa, *Davidse 34360* (MEXU, MO). MEXICO. **Chiapas:** Mpio. de Ocozocoautla de Espinosa, Res. Selva El Ocote; est. El Encajonado, 1.5 km al E del campamento, *H. Hernández H. 3242 & A. Bolom* (MEXU).

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Literature Cited

Torres C., R. 1999. El Género *Bauhinia* (Leguminosae: Caesalpinioideae: Cercideae) en Mesoamérica. Tesis de maestria, Facultad de Ciencias, Universidad Nacional Autónoma de México, México D.F.

———. 2001. Una especie nueva de *Bauhinia* (Fabaceae: Caesalpinioideae: Cercideae) de Panamá. Novon 11: 143–145.

Wunderlin, R. P., K. Larsen & S. S. Larsen. 1987. Reorganization of the Cercideae (Fabaceae: Caesalpinioideae). Biol. Skr. 28: 1–40.

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